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Journal of the
Canadian Peat Society

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ADDRESS BY HON. CLIFFORD SIFTON

Chairman of the Commission of Conservation

At the AMERICAN PEAT SOCIETY'S CONVENTION, Evening Session

MONDAY, JULY 25th, 1910

THE PRESIDENT: We have been very fortunate indeed in securing the consent of Hon. Clifford Sifton, Chairman of the Conservation Commission, to address you and say a few words of welcome. (Applause.)

HON. MR. SIFTON: Mr. President, Ladies and Gentlemen: I have been asked to say a few words by way of addition to the welcome you have already received to the city of Ottawa. The city of Ottawa has a reputation for hospitality, and I trust its reputation has been lived up to by the reception you have received today. I may say further, that, while I have no claim to speak with any expert knowledge, when you have carried out your program and visited the work already begun under the direction of your President, Dr. Haanel, you will have come to the conclusion that the work done by him in connection with the study of the peat question has been of a practical and useful character. (Applause.)

I need not remark upon the nature of the program which has been prepared for your meeting, and the evidence it gives of a desire to make that meeting useful. It is characteristic of your President that when he takes up anything he does it with extreme thoroughness and care, and I doubt not that this characteristic will be in evidence in the conduct of your proceedings here.

I have been much interested, and I may say surprised as well, in glancing over the records of your Society, to learn of the extensive and systematic efforts which you have been making to solve the problem of making the most beneficial use of the great supply of fuel which we possess in the peat bogs of America. I have myself found that it very often happens in examining the proceedings of scientific or semi-scientific societies that it took most of the time to separate the wheat from the chaff, that is to find out what there was worth carrying away,

but I have been convinced, in a cursory examination of your proceedings, that that labor was not necessary, for you apparently recognize that, while endeavoring, as you are, to solve an economic problem, it must be done in a practical way, and your proceedings therefore deal very properly with real facts in connection with the problem. Only real results are dealt with. This is eminently necessary in dealing with a problem which is in its nature altogether a practical one.

It is a matter of gratification that you have responded favorably to the invitation to hold your present meeting at the Capital City of Canada. The Government has, by sanctioning this invitation, indicated its appreciation of the importance of your work, and the holding of your meeting here cannot fail to reward the liberality of the Government by helping to diffuse more general knowledge throughout Canada of the present status of the peat question, as well as by arousing a more intelligent interest in that question.

Sometimes in Canada, as well as in the United States, we have been too prone to begin work of an experimental character without making a proper and thorough study of what has been done in other countries. I believe this has taken place in regard to the manufacture and exploitation of peat fuel and has led to considerable unnecessary loss of capital and energy. The conduct of such meetings as that which you are holding here is the best in fact, almost the only practical method of making generally available the exact facts of the position.

May I, as an onlooker, make a practical suggestion upon this point? My suggestion is that a competent committee should be formed at each of your annual meetings to frame a short practical statement embodying a summary of the position of the peat industry of the world, in the light of the latest facts available at the time of your meeting. Such a statement should contain exact information in the briefest possible form showing the number of peat plants in operation; methods employed; amount of product; approximate cost of production; use to which the product is put, and other similar information. If printed in your annual proceedings it would constitute a practical reference table on the subject which I venture to say would, as soon as it became known, be effective in circulating very many thousands of copies of your report in quarters where it would be of the greatest benefit.

Your society is working for the purpose of accomplishing an economic result. There are two questions which are immediately suggested in connection with the work and, which demand a definite answer.

First, Is the result itself worth the efforts that must be put forth to achieve it?

Second, Is there a reasonable probability of success?

First, is it worth while? As to this I imagine there can be no doubt. What is the object? It is to render available, as fuel, the immense peat bogs of North America. What does success in this effort mean? It means importing a very appreciable factor into the solution of the problem of light, heat and power which will make them more available to the people at large. That is stating the matter in a purely general way. I would like, however, to state it in a more particular way.

We, in Canada and the United States, have been living amid a bountiful supply of the natural resources of wealth. We have hardly known what it is to be in need of anything that is really necessary to existence. In this city of Ottawa, ever since its existence, there has been a constant struggle to get rid of the wastage of manufacturing which, in other situations, would have been of great commercial value. Ottawa is therefore a typically difficult place in which to get people to realize the value of fuel. Some of us who stand here were born upon farms, upon which, when fuel was required, it was only necessary to go out and cut it—the destruction of the tree in itself was regarded as adding value to the land from which it was cut.

We are, however, coming, if somewhat slowly, to a better realization of what these things mean and, among other questions, we are beginning to realize what the fuel problem means to great masses of people after the supply of timber has been so far depleted that cheap fuel is no longer available. In the great centers of population in the Northern United States and Canada—as it is soon to be in its present course of development—the mass of the population will be wage earners, living by their daily earnings and in a climate which, for at least four months of the year, requires a large amount of fuel for family use—cheap and abundant fuel is a necessity of existence.

There are districts in Canadian cities today where families are herded together with insufficient space for health and really civilized life, because of the cost of fuel in the winter, and this condition will tend to increase rather than diminish. The coal supply of the continent is measurably well known, and the conditions of its extraction and marketing are thoroughly well known. It may be safely said there will be no permanent reduction in the price of coal—rather is it reasonably certain that there will be a gradual but steady increase. That is a matter that will bear a good deal of thinking about. We say the price is so much, and with our comparatively few railways we have no possible prospect of seeing coal any cheaper —it will become higher, more expensive and more difficult for the man who earns $1.50 a day to educate his family and keep his house in such a condition as his family can live comfortably throughout the winter. We may get much heat from water power in some localities favored by nature, such as the neighborhood of the Ottawa River, but so far, the cost of development, maintenance and management does not encourage us to the belief that we shall be able to make the "White Coal" a poor man's fuel.

I want to read the only authoritative statement I know of about the coal supply. It is short and gives the facts succinctly. It is as follows:

"From the beginning of coal mining in this country (1814) to the close of 1907 there were mined nearly 7,000,000,000 (6,865,000,000) tons. Adding to this one-half additional, representing the waste in mining, gives a total of more than 10,000,000,000 tons taken from the supplies originally available.

"The rate of production has increased rapidly. The average increase from 1846 to the close of 1907 was 7.36 per cent. per annum, practically doubling

the production every ten years. There has, however, been a decreasing rate of increase in production when considered on a basis of twenty year averages, and Mr. Henry Gannett of the United States Geological Survey, on this basis estimates the easily accessible and available coal supplies, aggregating 1,400,000,000,000 tons, would be exhausted about the year 2027, and that the entire coal supply would be exhausted about the year 2050.

"As a practical matter it should be understood that coal production will not increase to a certain point and then cease, but that long before the time of exhaustion of supply has been approached there will come a gradual decline in annual production of coal owing to the increasing scarcity and cost. Already, the price of anthracite and some other coals is advancing because of exhaustion of thicker beds and increased cost of working.

"The adoption of more efficient methods in connection with the mining and utilization of coal, and the increasing use of water power and other substitutes for fuel in power development, will diminish the present increasing rate of consumption, and thereby extend the life of our coal supplies beyond the dates mentioned. On the other hand, it is expected that manufacturing will continue to grow more rapidly than population, and this will increase the rate of coal consumption for power purposes even more rapidly than for heating.

"The factors in the above estimates are sufficiently reliable to make it clear that without a serious lessening of the present rate of coal consumption, either through the extensive development of substitutes for it, long before the middle of the next century is reached the nation's supplies of available coal will be so largely depleted as to bring serious hardship and a curtailment of industry."

There is the conclusion arrived at, and it points to the importance, nay to the necessity of developing every other possible fuel substance, and I especially emphasize the feature of it which has reference to domestic fuel, to the importance of it to the population who have not yet reached the more expensive kind of fuel.

In Canada we have coal in Nova Scotia, Alberta, British Columbia—but between Alberta and the New Brunswick line, little coal of economic value, so far as known; but in those portions of the country where there is no coal, peat bogs abound. For instance, in Manitoba there is perhaps the greatest necessity for cheap fuel for the masses of the people, more than other people in Canada, because this is the coldest province. There is little wood there, but there are great peat bogs. I have seen railway banks burning for days and days at a time, and the time will come when these immense bogs at the door of the people of Winnipeg will be made available for use as domestic fuel. (Applause.)

Now, as coal becomes dearer, the difficulty and uncertainty of the supply, of which we have had very vivid experience in the past, becomes more accentuated, the importance of an alternative and substitute fuel will become more pressing. If, therefore, the great peat bogs of Canada can be successfully converted into a fuel which shall be, if not so desirable as Pennsylvania coal, yet a practical domestic fuel, substantially cheaper than wood or coal, and abundant and certain in

quantity, the boon thus conferred upon the future inhabitants of Canada and the Northern United States can hardly be over-estimated. (Applause.) It will literally mean life and happiness to millions of people.

Not so important in one sense, but yet of great significance economically, is the influence which peat may have upon the question of light and power. There are peat bogs giving abundance of raw material where there are no water powers. In such localities it will be a simple matter, by the establishment of such plants as that which has been built in Ottawa under the direction of the Department of Mines, to effectively and cheaply produce the light and power required for neighboring communities, and so take an important part in the economic organization of society.

Is it worth while to make the effort? Those of you who are engaged in the work as a matter of business will answer that question in a business way, but, to all of you let me say that there is no effort in connection with the material affairs of life which is so well worth while making, as that which, if successful, will permanently add to the comfort and happiness of great numbers of the people of our race.

It is an unfortunate fact that most of us, from the circumstances of our calling or occupation, are not able to do much which tends to better, in any great degree, the condition of others. The ideal life is that of those who, while following their own avocations, are at the same time laboring for the advancement of knowledge in some field, the cultivation of which tends to promote the elevation and the happiness of the human race. Such a life pursued with contentment, with enthusiasm, with a chivalrous and generous appreciation of the efforts of others, and with an earnest determination to bear as much of what Bacon so well calls "fruit," is the highest form of existence in our modern society.

As to the reasonable probability of success in ultimately effecting a complete solution of the problem of the utilization of peat fuel, while I have no title to speak with any expert knowledge I express myself with complete optimism. The difficulties to be overcome seem to me to be so slight in comparison with those which have been overcome in other fields, and the attendant benefits so large that I look upon success as not only probable but certain within a very few years.

I welcome you gentlemen as partners and coadjutors in the great work in which I am most deeply interested, the conservation and proper utilization of our Natural Resources.

I welcome you as a body of men engaged in the solution of a practical economic question which is fraught with most important consequences to great numbers of people.

I trust that your meeting will be most successful and that the interchange of thoughts and experiences will add materially to our knowledge upon the important subject which is to be the subject of your deliberations. (Loud Applause.)

THE PEAT PRODUCER GAS POWER PLANT AT THE GOVERNMENT FUEL TESTING STATION.

By B. F. Haanel, B.Sc.

Chief Engineer, Division of Fuel and Fuel Testing, Department of Mines, Canada.

Owing to alterations in the construction of the peat gas producer, now being made by the Korting Brothers of Hanover, Germany, the tests which have been made and are now under way are not complete. This paper, therefore, can only treat in a general manner of the production of power from peat in so far as it relates to the investigations made at the Fuel Testing Station.

The reasons and necessity for the establishment of a Fuel Testing Station, and the benefits which it is expected will accrue to those provinces which possess no coal deposits and consequently are dependent on foreign sources for their fuel for all purposes, by demonstrating a satisfactory and comparatively cheap method for the production of power from peat, lignite and the cheaper grades of the imported coals, have been many times stated, so that it will be unnecessary to reiterate them here.

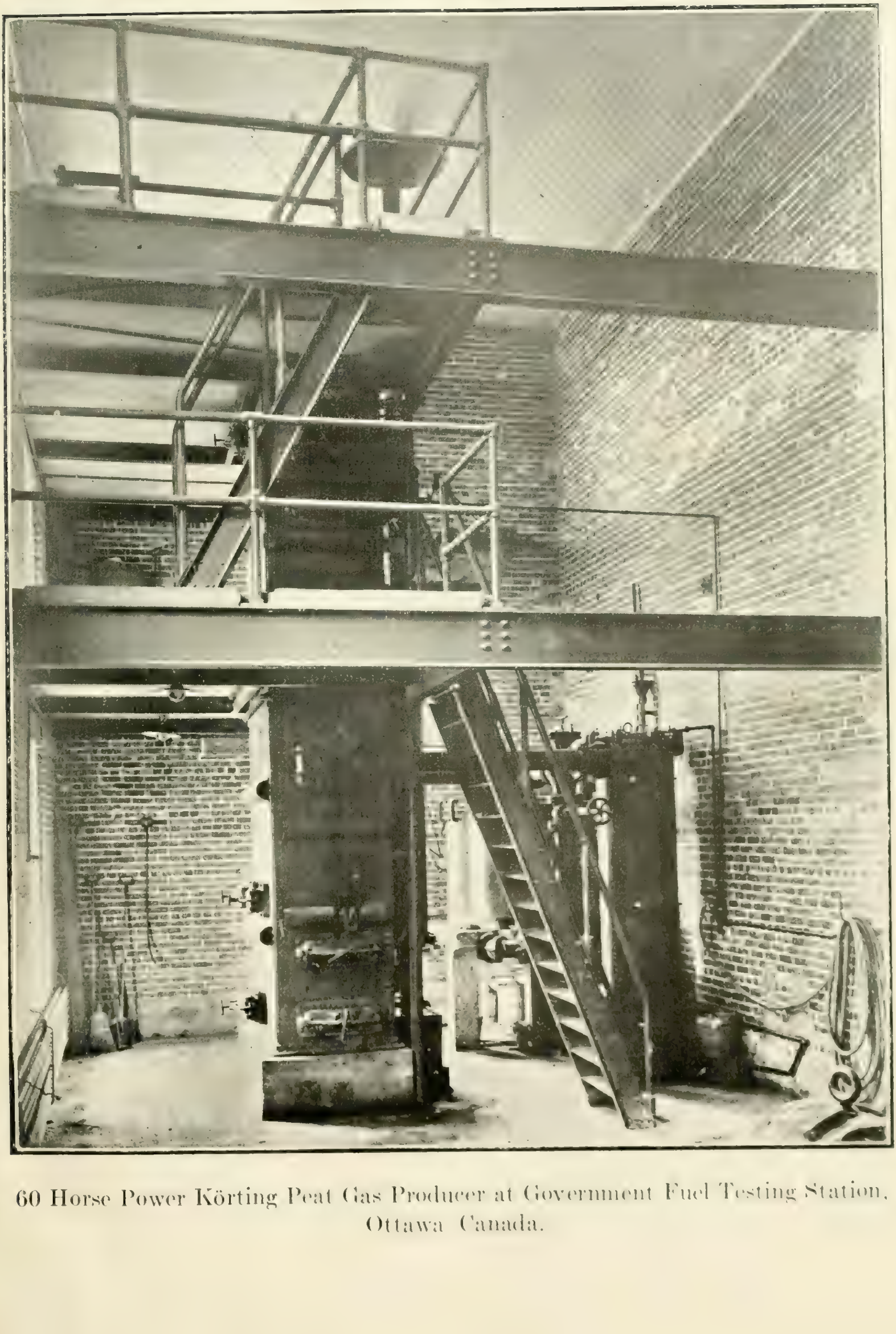
While the Fuel Testing Station was originally erected for the purpose of demonstrating a commercial and economical method of generating power by the utilization of peat in a gas producer, the plant has been enlarged sufficiently to include the investigation of lignite and coal in the producer.

That part of the power plant in which peat is exclusively used consists of a 60 Horse Power Körting peat gas producer and gas engine with a direct connected 50 K.W. direct current generator. The load which it is desired to carry on the engine is regulated by means of a portable resistance stand capable of absorbing the full load of the generator.

The producer gas cleaning apparatus consists of a wet coke scrubber, tar filter and a dry scrubber. The engine is started by means of compressed air, which is supplied by a compressor driven by a 3 H.P.—a. c. motor, which charges into a receiver. A suction fan driven by a 1 H.P.—a.c. motor is provided for starting the producer.

Description of Producer.

The Körting peat gas producer, as originally installed, consists of a rectangular steel shell about 15 feet in height from the floor level by about 5x3 feet in horizontal section. Near the top, grates are provided on either side. These two entirely independent grates are separated by a space approximately 12x12 inches. Below the grates are chambers into which the ashes drop, and these ash chambers and the grates above are accessible through two doors. About 3 feet above the floor level there is a second grate with two ash pits, one on either side, access to which is provided by two doors as above. Directly above the grates near the top



60 Horse Power Körting Peat Gas Producer at Government Fuel Testing Station, Ottawa Canada.

or upper zone, a cast iron chamber is provided. This chamber is connected by means of a water jacketed pipe to a similar chamber beneath the grates near the bottom of the producer. This is called the lower zone. These two chambers are provided with doors for the purpose of cleaning. In addition to the doors just described, there are two doors situated on the back of the producer just over the lower zone grate bars through which the fire can be poked or cleaned.

On top of the producer are two hoppers for feeding fuel to the two grates of the upper zone. The doors covering the ash pits of the upper and lower zones are provided with adjustable air openings. The lower end of the water jacketed pipe mentioned above, is submerged in a water seal.

The lining of the producer, which is made of the best quality of fire brick, conforms to the general shape of the producer for a distance of about four feet above the grate bars of the lower zone. From this point, the lining is jogged or stepped on the two narrow sides until the grate bars of the upper zone are reached, leaving a space of about 12x12 inches.

Principle of Operation.

The green peat containing about 30 per cent. moisture and a large amount of volatile matter is fed through the two hoppers described above, and is partially burned on the grates of the upper zone. The heat resulting from the combustion of peat is, or should be, just sufficient to drive off the moisture and volatile matter; leaving behind practically pure peat coke, which falls through the narrow opening below the upper grates into the lower zone where the final and complete combustion takes place.

In addition to the moisture and heavy hydrocarbon vapours driven off from the peat during the process of coking, the gases passing into the lower zone contain nitrogen, a small amount of carbon monoxide, carbon dioxide, and a trace of methane and ethylene.

When the producer is in condition for operation, the space between the grates of the lower and upper zones is filled with peat coke, the lower layer of which, for a height of about eighteen inches above the lower grates, is incandescent owing to the combustion of the coke on these grates

The gases, heavy hydrocarbon vapours and moisture evolved from the combustion of peat in the upper zone, are drawn up (by means of the suction of the fan or engine) into the gas chamber above the grates of the upper zone, previously described, into and down through the water cooled pipe into the chamber beneath the grates of the lower zone and then up through the bed of incandescent peat coke to the two off takes on either side of the producer to the cleaning system and engine.

A small quantity of the heavy hydrocarbon vapours and possibly some of the moisture is condensed on the walls of the water cooled pipe and drops into the water seal below, where the resulting tar can readily be removed.

The gases of the upper zone and the remainder of the hydrocarbon vapours and moisture now pass through the incandescent coke of the lower zone. Here the hydrocarbon vapours admitted into the lower zone together with the moisture (steam) and air admitted through the air openings in the ash pit doors, in passing through the hot carbon either burn, or are split up into permanent combustible gases. The moisture is reacted upon by the hot carbon. The result of this reaction is free hydrogen and either carbon monoxide or carbon dioxide. The carbon dioxide, evolved in the upper zone, is reduced to carbon monoxide. The final gas consists of a large quantity (by volume) of nitrogen, carbon monoxide and smaller quantities of carbon dioxide, hydrogen, methane and ethylene.

The Cleaning System.

As previously mentioned, the cleaning system consists of a wet coke scrubber, tar filter and dry scrubber.

The wet coke scrubber consists of a cylindrical, steel shell about 6 feet in height by 2½ feet in diameter, closed at the top by an air tight cover and at the bottom by a water seal. This shell is filled for a height of about 3 feet with coke. When in operation, this coke is continuously sprayed with cold water. The final gas leaving the producer enters the scrubber near the bottom and leaves near the top. In passing up through the wet coke and water spray, the gas is cooled and most of the dust and a large quantity of tarry matter, which escaped decomposition in the producer, is removed.

From the wet coke scrubber, the gas passes through the tar filter. This filter consists of a cast iron box about 3 feet in height , and 3 feet by 6 inches in horizontal section. Inside this box are fixed a number of baffle plates and four perforated metal plates which are placed near the outlet. These plates can be sprayed with hot water when the suction on the system indicates that the filter is clogged. The gas enters at one end of the filter and passes in and out among the baffle plates and through the perforated metal plates and then into the dry scrubber. Most of the tarry matter carried with the gas past the coke scrubber is removed in this filter and flows off with the wash water into the seal. The dry scrubber is a cylindrical steel shell about 4 feet in diameter by about 3 feet in height, closed on the top and bottom. The top cover can be removed. This shell is packed with excelsior through which the gas must pass before entering the engine. Free moisture and some tarry matter is removed from the gas in its passage through the scrubber.

Results of Tests.

Several tests have been made with the peat manufactured at the Victoria Road peat bog, and with that manufactured at the Government peat plant at Alfred.

In these tests, peat with varying quantities of moisture were used, the lowest quantity being 15 per cent. and the highest about 43 per cent. Since the pro-

ducer is designed to operate with peat containing from 25 to 30 per cent. water and is therefore not provided with an evaporator for supplying steam (which is absolutely necessary when running on dry fuels), 15 per cent. moisture peat was found to be too low for satisfactory operation owing to the high temperature prevailing in the producer and of the final gas,—thus lowering the thermal efficiency,—and the formation of some tar.

While peat containing moisture up to about 40 per cent. can be used by operating the plant at half load, the most satisfactory moisture content was found to be about 25 to 30 per cent.

Any tar which may be formed and find its way past the cleaning system into the admission valve and cylinder of the engine can be easily removed while the engine is running, by injecting into the open end of the cylinder a mixture of oil-soap and water. Tar resulting from the distillation of peat is readily soluble in such a mixture and in this respect differs from coal tar.

Fuel Consumption.

The average fuel consumption per B.H.P.H. at full load (60 H.P.) was found from many tests to be from $2\frac{1}{4}$ to $2\frac{1}{2}$ lbs.

For one Brake Horse Power year of 3,000 hours (300 ten-hour days), this would amount to 3·75 tons.

For the purpose of showing the saving in fuel costs, which can be realized by generating power from peat in the peat producer gas plant, the following comparisons are given.

In estimating the following costs, the cost of one ton (2,000 lbs.) of machined peat, at the bog where the producer-gas plant is assumed to be situated, is taken at $2.00. The cost of a ton of soft coal is assumed to be $4.00 in car-load lots, f.o.b. At some points this price would be less, while at others it would be considerably higher.

The consumption of peat per brake horse power hour is assumed to be $2\frac{1}{2}$ lbs.; lower fuel consumptions have been obtained, but the writer desires to use a conservative figure.

The fuel consumption per brake horse power hour of the coal producer gas plant is taken at $1\frac{1}{2}$ lbs., and that of the steam plant at 6 lbs. The latter figure relates only to comparatively small plants.

On this basis, the fuel costs per brake horse power year (3,000 hours) would be as follows:—

	Fuel, Cost per Brake Horse Power. Year.
Peat producer gas plant, peat at $2.00 per ton..........	$7.50
Coal " " " coal at 4.00 "	9.00
Steam plant " 4.00 "	36.00

When peat is manufactured on a larger scale with machines provided with mechanical excavators and other labour saving devices, the above cost ($2.00) per ton will be very greatly reduced, so that a power plant situated at the bog will be able to show a much greater saving in fuel costs over that of a coal producer gas plant or steam plant.

In order to arrive at the saving, which will be effected by the utilization of either peat or coal in a producer gas power plant over that of a steam power plant, it is not necessary to estimate the operating costs and fixed charges since these will remain about the same for all the plants in question. A slight saving will, however, be realized in the peat producer gas plant, over the steam and even the bituminous coal producer gas plant, in the operating costs, since the peat producer gas plant is very easily handled, the producer practically taking care of itself. Hence, one man, an engineer at moderate wages, can easily take care of a 100 H.P. plant. While this is true in a general sense, the writer has seen a 150 H.P. bituminous coal producer plant handled entirely by one man, but such cases are not common. A bituminous coal producer is more difficult to operate and requires more or less constant attention, and therefore for proper working should have the services of a stoker. A steam plant of like capacity would require a fireman in addition to the engineer. In short, a peat producer gas power plant, in its simplicity and ease of operation, is not unlike an anthracite producer gas plant, which is recognized as the simplest of all such plants.

While hydro-electric energy is in many sections of those provinces possessing water powers, the cheapest power available, and for many purposes the most suitable, it must be borne in mind that there is a limit to which electric energy can be economically transmitted, since the cost of power increases rapidly with the length of the transmission line. In addition, there are localities which cannot be served by such transmission lines and still others to which such power is not suitable—for example, those requiring a 10-hour or intermittent service. For such districts, it is manifestly cheaper and more satisfactory to develop power independently by some other means, and it is hoped that producer gas power plants erected on a few wisely chosen bogs will serve this purpose.

The demonstration plant at Alfred and the Peat Producer Gas Power Plant erected in the Fuel Testing Station at Ottawa (the former serving to demonstrate a commercial process for the manufacture of a cheap fuel from peat and the latter serving to demonstrate an entirely commercial, economical and reliable method of generating power from such fuel), will, it is hoped, prove instrumental in:—

1. The development of such of the peat bogs found in the provinces of Ontario and Quebec, as are suitable for the manufacture of peat fuel, along sane and commercially profitable lines.

2. The establishment of power plants on the bogs, which will serve existing towns and cities with electric light and power, and attract industries to those parts of the above provinces which can be economically and satisfactorily served by such power.

THE DORCHESTER PLANT FOR MANUFACTURE OF PEAT BRIQUETTES.

DR. J. McWILLIAM, LONDON, ONT.

During the summer of 1905, W. A. Milne & Sons, of Hamilton, Ont., installed a plant for collecting and briquetting peat at Dorchester, for Dr. J. McWilliam, of London.

A description of the machines has already been given in several reports, and need not be repeated here except very briefly.

By our process, the surface of the bog is first cleared of green moss and timber and stumps, then it is harrowed and the surface dries by the sun and wind. Of course, shallow ditches have to be dug to carry off the surface water if there is any. It has been found that a field of harrowed peat exposed to the sun and wind on a fair day, will dry down to 25% to 30% in two hours to a depth of a quarter to a half inch. Our collector is then passed over the dried surface, and by the action of a vacuum fan the dry peat is sucked up and stored in a dump car and conveyed to a store house. This part of the process has always been a pronounced success, the collector working well, and at a low cost per ton of the collected material.

The next step is to dry the collected peat dust down from 25% to 5% to 8% moisture. To do this cheaply and rapidly has been found very difficult. Various plans of driers have been experimented with, and while the promoters cannot announce complete success, they have every reason to believe that the steam-plate drier now being installed will do the work cheaply and rapidly. It is intended that the new drier will be at work by June 1st of this year.

The next operation is to compress the fully dried dust into briquettes. When the drier provided properly dried and heated dust the press has been most satisfactory, giving a hard block which ships well and burns well, and is in much favor with people who have burned it. Many people use it entirely when they can get it, and many assert that it is cheaper and better than wood or coal. Some have compared it with hard coal by actual experiment, and found that it lasted as long as coal. A man heated his house with a single stove—a cooking range fitted to burn hard coal. He found a ton of coal lasted 20 days, while a ton of peat briquettes lasted 21½ days, and had all the good points of coal. He had always a warm house all night, had a fire in the morning which was much easier to get going when low; could boil water much quicker in the morning with peat than with coal, and in point of cleanliness, it was at least the equal of coal, and his experience was also that of many others.

About 1,200 tons have been sold during the six seasons of experiment, and the promoters expect by improved machines to greatly increase the output for this season.

Working as an experiment it is impossible to estimate the cost of production per ton by this method, but the promoters feel confident that they can produce it as cheaply as by any other method, and in a few seasons can make it at a good profit. The price obtained for it would average $4.50 per ton at the factory.

To encourage work so necessary to the welfare of the people of Canada, it is the opinion of the promoters who know the situation well, and the extreme difficulties of solving the problem of drying in an economical way, that the Canadian government should grant a good liberal bonus to workers in this industry, making the bonus very high at first, and to be reduced every five years or removed altogether when it was found that the peat industry was self-sustaining, which, we believe, would not be long if more capital and better engineering skill could be got to enter the field, and in our opinion nothing would so soon attract the attention of capitalists and mechanical skill as a good liberal bonus offered by the Government.

Note.—Under date of October 16th, Dr. McWilliam writes: "Owing to our new dryer being too weakly constructed, our output is going to be limited, but we will be ready for next season, and will still make a good deal this season."

THE IMPROVED ANREP MACHINERY FOR THE MANUFACTURE OF MACHINE PEAT.

Written for the Canadian Peat Society, March, 1911, by Ernest V. Moore, B. Sc., A. M. Can. Soc. C. E., Mining Engineer.

It is probable that few people will attend the first Annual Meeting of the Canadian Peat Society that are not more or less familar with the process of making Machine Peat. Nevertheless, a short description of the process itself with more particular reference to those operations that are distinctly Anrep, may be interesting at the present time.

The operation of manufacturing Machine Peat Fuel does not belong alone to Mr. Anrep. It is a development to which many talented men have given much time and not a very few valuable devices, and it consists in the following very simple series of operations.

Granted that a suitable bog has been procured: First, it must be drained; Second, a drying area must be prepared on its surface; Third, means must be provided to excavate the raw material; Fourth, this must be macerated and puddled into a homogeneous mass; Fifth, this mass must be spread in an even layer over the drying field; Sixth, it is here cut into convenient sized blocks and is allowed to dry, exposed to the weather; Seventh, during this part of the operation it is usually necessary to turn the blocks over once or twice; and Eighth, when sufficiently dry it is taken in the form of fuel, fit for use, into a storehouse or on to the cars.

Before going into detail with regard to these operations, it is desired to point out that this process is simply one of moving so many cubic yards of material so many times, operations about which there is neither mystery nor difficulty, either technical, mechanical, or commercial, and it is for this reason that the introduction of the manufacture of Machine Peat Fuel into this country, to replace the various processes in which artificial drying and briquetting have been attempted, will, we believe, in a very short time, put the peat fuel industry on a profitable commercial basis, in Canada. The entire credit for this very sensible movement, that is, the demonstration of the possibilities of this Machine Peat Fuel manufacture, is due to Dr. Haanel, of the Department of Mines, and no one can realize so well as the men who have been actively associated with the earlier attempts to make peat fuel in this country, how great this service has been, not only to the peat men, but also to the country at large.

The Anrep Process, as distinct from any other method of making machine peat, of which there are many, refers particularly to operations 3, 4, 5 and 6, just detailed, and consists in performing these operations with devices he has invented.

His first work was in connection with the macerating machine, the one device in the whole operation that is peculiar to peat. In August, 1883, the Russian government held a severe international competition on the Bissereva bog near Moscow, in which practically all the well known machines were entered. Anrep alone received the highest award and since then his macerating machine, improved fom time to time, has held first place in the industry. A report by Larson and Wallgren, to the Swedish government, showed one thousand Anrep machines in operation in Russia, in 1900, and even Lieut. Ekelund uses an Anrep macerator in the plant with which he obtained such promising results last year. Its efficiency simplicity, strength compared to weight, and accessibility are all noticeable, and compare favorably with other machines in the market.

The Anrep machine is, then, the basis of the Anrep process, and following this came his system of cable transportation on a round track. This is altogether Mr. Anrep's invention, and is the second device in his process. Originally the peat pulp was moulded from the spout of the peat mill on to boards, and these were pushed by hand out to the drying field on skeleton cars travelling on portable track, which was shifted from time to time as was necessary. The moulded peat was then dumped from the boards onto the bog surface and the empty boards taken back.

This cable transportation opened up a further development, in that the peat pulp was taken to the drying field in bulk, and there spreading and moulding were combined in the Jackobsson field press, completing the Anrep process as illustrated at Alfred.

Recently, Mr. Anrep has patented a number of further improvements in that he has introduced, most important of all, an automatic excavator. He has also improved the macerating device and his cable transportation, and offers a new spreading device of his own design, calculated to handle double or treble the output at Alfred, and which also has a simple automatic device to cross cut the peat.

The object of this paper is to more particularly describe these improvements, and to give some general information regarding their installation and operation, and a summary of the results to be obtained.

A suitable bog consists of a peat deposit that first of all is of such quality as will make good fuel, and second, and equally important to this process, that is capable, at least, of surface drainage. It is essential that two, or better still three, feet of natural drainage be possible, and of course, it is more desirable if the bog can be drained to the bottom. The working face must be comparatively dry, but all other conditions being favorable, the pit from which the raw material is being taken may economically be kept unwatered, by pumping, and, as it is equally desirable to have the working area flooded in winter time to prevent the action of frost, the condition of too complete drainage is not an unmixed benefit.

The drying area is easily prepared, in that it is only necessary to remove the brush, stumps, and other obstructions, and generally to bring the surface to a uniform level. On some bogs practically no work at all is necessary, while on others, particularly those covered by heavy brush and small trees, considerable effort may have to be expended.

The bog being thus prepared the next step is to provide machinery for the three operations; excavating, macerating and spreading.

Until comparatively recently the first of these has been done by hand. It has been admitted that it is desirable to excavate automatically, but cheap labor in Europe lessened the necessity for such an innovation there, and it has been claimed from time to time that no excavator would work satisfactorily on account of the roots, etc., to be encountered. During 1910, however, three distinct successes have been demonstrated, by Lieut. Ekelund, in Sweden, by the Canada Fertilizer Co., in Quebec, and by the Peat Engineering Co., of Toledo, Ohio. Ekelund, because of a perfectly drained bog, with a hard gravel bottom, was able to introduce a heavy clay and gravel bucket excavator, with which he obtained some very remarkable results, in that, by the use of this device and working on a comparatively large scale, he was able to cut former costs practically in half. His device permitted his digging around the roots and leaving the way clear for a workman to remove them out of the way. As at present constructed, his excavator is adaptable only to bogs of very special formation, in fact, only to such deposits as would permit equally well of the use of a steam shovel.

The excavator of the Canada Fertilizer Co., is a much lighter contrivance, designed particularly for peat, and considered, separately from the device in which it is incorporated, is a distinct improvement on Ekelund, as it is light, and yet very strong. No provision is made to pick out the roots, the idea there incorporated being to put everything through the macerator, the excavator being strong enough to break up and tear to pieces almost any obstruction it encounters in the bog. This, however, although doing away with the labor of picking out the roots, is undesirable, as the fewer undecomposed roots, no matter how finely they may be cut up, the better the finished product. This excavator easily did the work of 12 to 14

men, with an expenditure of not over 10 horse power. As the objections and difficulties to be met with in its use are being taken up in another page, there is no need of dealing with them bere.

The Peat Engineering Co. have an entirely new idea in their worm excavator, which again works on the principle of eating up everything, no matter how large or solid, it comes in contact with. It has only had an experimental trial thus far, but mounted as it is, it is open to the same objections as the Canada Fertilizer Co. device, although it appears to be both effective and efficient as an excavating agent.

Experience and common sense would seem to point out that there is a definite way in which the series of operations already mentioned as going to make up the process of manufacture of machine peat should be carried out, in that, the excavating and macerating are best done from a movable platform kept adjacent to the working face, and that the spreading for drying is done, preferably on the surface of the bog immediately adjacent. It would also seem desirable that any peat deposit should be worked in such a way that the raw material is cleaned up as the work progresses, and the deposit systematically worked out.

The general plan adopted by Mr. Anrep, Sr., along with all others, except the Canada Fertilizer Co., and those who advocate the same plan, is to excavate along a trench, so chosen that it is widened out by continued excavation, and that the bog will be exhausted to the best advantage. The width of the trench excavated in one operation depends on the depth of the raw material. The peat pulp is spread away from this trench, in rows at right angles to it, and of such length that the excavating and macerating plant is continuously in the same relative position to the spreading operation. For example, supposing the trench to be 20 feet wide and the peat 10 feet deep, 200 cubic feet would be excavated for every foot the whole plant moved ahead. In going through the macerator, this volume would be reduced probably 15%, leaving 170 cubic feet of pulp to spread. Now, to keep pace with the movement of the plant this must be spread in a strip one foot wide, and if spread 4 inches deep would require three times 170, or 510 feet long, making the spreading area this width. If the excavated area were 30 feet wide, this width would be increased to 765 feet, which is probably getting nearly as wide as would be found economical.

So far as the excavating is concerned, then, a satisfactory excavator must excavate at various depths up to the depth of the peat in the bog, and it must excavate a trench up to 30 feet or over in width, and it should not leave vertical walls, as these have a tendency to cave in and interfere with the systematic working of the plant, besides losing a lot of material. It should also operate in such a manner as to permit of the roots being picked out without interfering with its work, and because in nine cases out of ten it must be supported on the soft yielding surface of the bog, it must be of comparatively light construction, with the weight spread well over the surface, and some distance back from the cutting face.

The Anrep excavator fulfills all these conditions, and although it is difficult to give a comprehensive description of this device, the following is submitted.

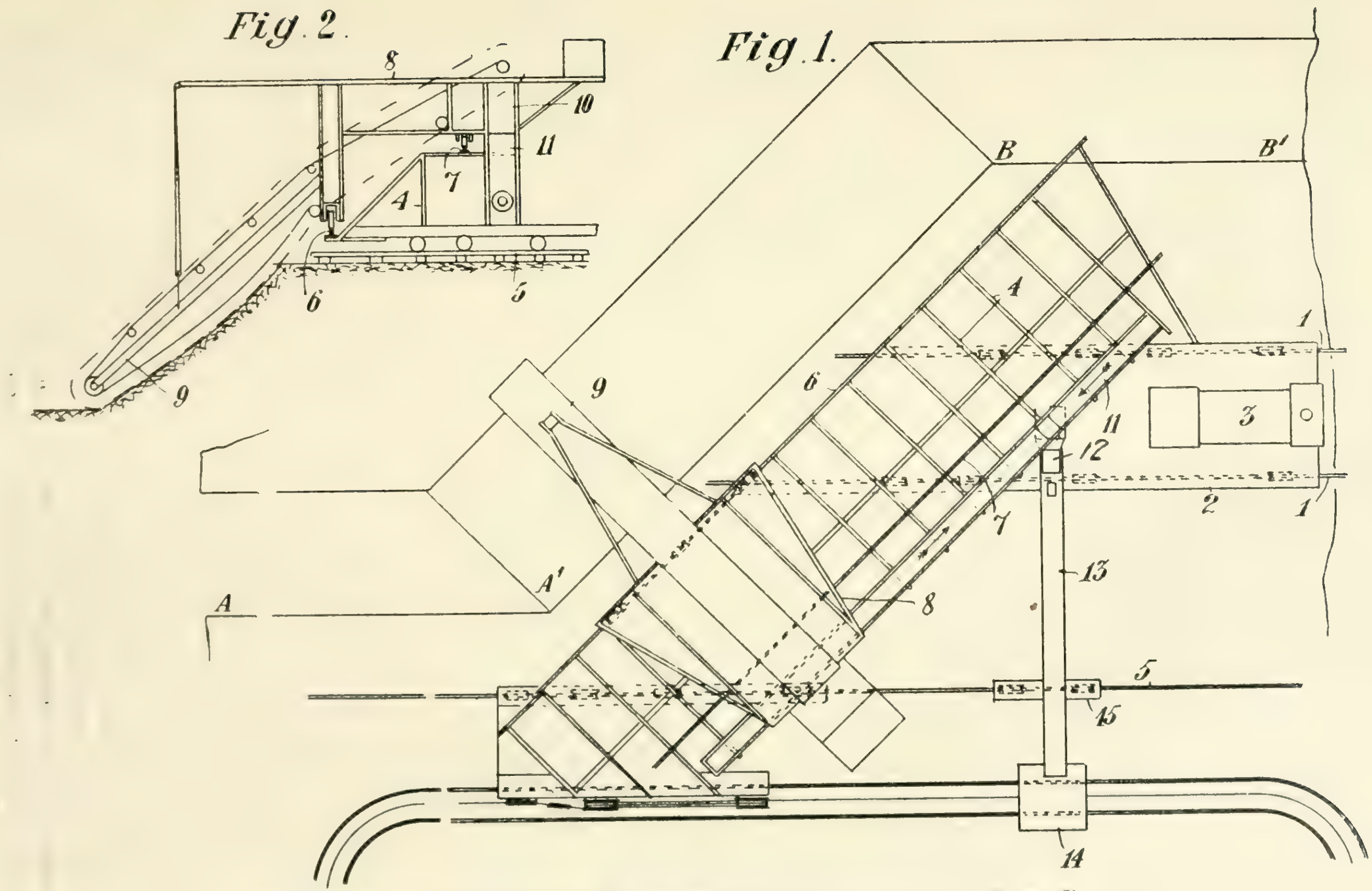
Like the Anrep structure at Alfred, the improved plant is built on a rectangular platform (2) supported on wheels, which in turn travel on portable track, (1) in short sections, resting on long ties, placed on the surface of the bog. On this platform, again similar to Alfred, is placed the motive power, (3) preferably an electric motor or motors, but if necessary, an engine and boiler can be used, and also the excavator, the macerator, and the other devices mentioned later on. The whole platform may be moved ahead automatically on its rails, as desired, and it moves in the direction of the working trench, excavating this trench up to its full width, in its rear, as it moves forward. On the rear end of this platform is superimposed in an oblique direction, a pair of rails (6 & 7) which project up to 15 or 20 feet on either side of the platform, the steel framework (4) supporting the projecting ends of these rails having an extra wheel running on an extra single rail, which helps further to distribute the weight on the surface of the bog. On these oblique rails there runs a light steel traverser (8) automatically moving from one side to the other the full width of the excavation, which carries the excavating agent (9). This traverser, driven by its own independent motor, is practically an independent device travelling slowly backwards and forwards on these oblique rails, excavating a layer of the raw material from the working face each journey. The entire supporting rails are moved ahead from time to time, as a new cut is made, by the movement of the underlying platform.

The excavator proper is of the ordinary bucket type, designed specially for peat, and is so mounted that it leaves all working faces on a natural slope. The depth of the cut is automatically adjusted, as desired, and while the excavator is in motion, by cables working on a power drum.

In operation the original platform remains stationary, while the traverser, carrying the excavator, makes its journey. Then the whole platform automatically moves forward a few inches for a new cut and the traverser makes its return journey, making a second cut the full width of the excavation, and so on.

From the buckets of the excavator, which are self cleaning, the raw material drops into a hopper connected to the excavator which delivers the peat into a stationary trough (11) running the full length of the superimposed rails, and parallel to them. This trough in turn delivers at a fixed point into the hopper of the macerating mill, (1) so that no matter in what position the traverser may be, the excavated material is quickly conveyed to the hopper of the mill. From the mouth of the macerating mill the now prepared pulp is conveyed to self dumping hopper cars (14) by a suitable conveyor, (13) and these in turn deliver the pulp to the spreading apparatus as at Alfred.

The unique features of this apparatus are, the shape of the buckets, which are self cleaning; the design of the excavator arm that permits of its adjustment to different depths; and the method of mounting the excavator on a traverser moving *obliquely* across the cut being excavated, in such a manner that all walls left standing are on a natural slope. The mechanical design is excellent, in that it is simple, strong and light, and permits of such wide distribution of the weight, that a very much heavier device could be supported in safety on the same area, on the softest of bogs.



PLAN AND SECTION OF IMPROVED ANREP PEAT EXCAVATOR AND FUEL PLANT.

The macerator on this plant is also of an improved type. The function of this machine is two-fold, in that it is desired to cut up very fine any undecomposed roots or grass in the raw material, and also to thoroughly mix and puddle the mass. The difficulties to be encountered are, to get these undecomposed materials cut up fine enough, and to keep the machine from clogging up, as some of the grasses, etc., found in the raw material are very tough and stringy. If pure, well decomposed peat only were to be dealt with, a shaft, with a number of projections of almost any shape, revolving in the mass would accomplish the desired end, but in practice such a device would be absolutely clogged up with roots and grasses in a very few moments, running.

The Anrep mill is peculiar, in that the arrangement and design of the knives is such that nothing can lodge in the machine, but everything is of necessity worked through the mill. The knives are very strong (of cast steel), and work against corresponding stationary knives, the edges being sharpened so that they act as so many pairs of shears, and a safety device is provided to prevent breakages if any foreign matter, or a too large piece of root, accidentally gets in, by a coupling on the drive pulley held together with wooden pins which shear before any metal part of the mill can break. This machine is also well designed, has no superfluous weight, and every part is easily accessible for inspection or repair.

The excellence of any peat mill, however, depends upon how well the small roots are cut up, the output of the mill compared to its weight, and the amount of puddling accomplished per horse power turned into the machine. In all these respects the new mill seems to excel any other now on the market. The principal change in the improved device consists in lengthening out the pugging chamber, adding more pugging knives, and in improving the mouthpiece by use of which the rate of discharge may be regulated and any amount of puddling desired may be obtained, by holding the pulp back. This, of course, would require more power if the output is to be maintained.

The new mill has a capacity up to 8 to 10 tons per hour of fuel, sufficient to take care of the full output from the excavator, and to deliver well over 150 tons of fuel per day of 20 hours.

The main platform also has suitable driving drums for the different cable hauls, and also a root pulling device whereby a chain is always convenient in the working pit which can be attached by the workman there to any roots too large to handle by hand, and the root pulled out and thrown out of the way of the excavator. Suitable housing for the motors and tools etc., is also provided.

Further improvements in the process at large, consist in a more convenient arrangement of the cable used to convey the cars of peat pulp to the spreading apparatus.

In the new arrangement, the length of the cable remains constant as the tracks are shifted, and this operation is greatly facilitated, and, also, a new arrangement of the cable to the spreading device permits this device to work in both directions, no time being lost in returning it to a starting point as now has to be done at Alfred.

Furthermore, a new spreading device has been designed, calculated to take the full output of the excavator and macerator, and improved in that it is provided with heavy rolls to more perfectly level down the drying field, also a spiral screw device is provided to more perfectly and evenly distribute the peat mass as it is being spread, and a simple device is provided, attached to the spreader, which cuts the peat crosswise, thus doing away with the work of doing this by hand.

This completes the improvements Mr. Anrep has made in the appliances peculiar to his process of making machine peat.

Before concluding this paper, it is perhaps desirable to outline generally the conditions necessary to install one of these plants, its operation; output and cost.

It is estimated that the life of a plant with proper handling will be about 20 years, and the following deductions are then more or less evident. The average output is placed at 15,000 tons per season, allowing 100 clear working days, two shifts per day, and seven and one-half tons per hour output. This will vary up to 20,000 tons per season, depending upon the weather, but is unlikely to drop under the above minimum figure even in the worst weather in this latitude. At 20,000 tons per season, for 20 years, raw material for 400,000 tons must be provided. An average bog, averaging say 8 feet deep, will yield at 200 tons per foot acre, 1,600 tons per acre, and, therefore, at least 250 acres must be provided. Generally speaking, it is advised to have at least 300 acres available per unit plant. This makes a square about 3,600 feet to a side, and this is the shortest possible working line that could be chosen in an area this size. If the deposit is rectangular a longer and therefore more desirable line might be obtained.

The drying season being limited, it is proposed to equip all the improved Anrep plants for working two shifts, that is, 20 hours per day, and in this time a minimum of 150 tons of fuel will be produced. At 200 cubic feet of raw material per ton of finished fuel, this calls for a daily excavation of 30,000 cubic feet and if the excavation is 30 feet wide and 9 feet deep, this will mean a travel for the whole plant of about 115 feet per 20 hours, or, it will take 31 working days to cross the property supposing no longer line than 3,600 feet can be chosen.

A minimum period of 60 days should be allowed for the fuel to dry, and, therefore, with a 3,600 foot trench, work would have to be done on each side during the season, and the line would preferably be laid out to divide the deposit equally. If the peat were 9 feet deep the drying area would be about 800 feet wide, and would have to be prepared on either side of the working trench which, incidentally, would in all probability be the main drainage ditch on the property. The total drying field would be about 130 acres.

The installation of the peat mill and the spreading apparatus is most simple, and would take only a few days, as the whole plant is complete in itself, that is, outside of the power, and this will assume a different aspect at almost every installation. The ideal power plant would be a stationary producer gas plant such as the Department of Mines have in operation at the Fuel Testing Station, at Ottawa, generating electricity which would be transmitted to the different motors on the

plant in the field, but this will probably be too high in first cost to appeal to those making a start in peat fuel manufacture. The next best thing is a stationary steam plant, generating electricity, and this might eventually be replaced by the producer outfit. The cheapest installation of all, and one quite satisfactory, is similar to that at Alfred, where a portable boiler and engine is installed directly on the platform of the peat mill.

In operation, when the plant is all installed, and supposing a stationary power plant is used, the following men are employed per shift, to put the peat out on the ground to dry:—

One engineer.
One helper for same, (a boy to fire).
One man, operating the peat mill.
Two men, picking out roots and shifting track for the main plant.
Three men, handling the pulp cars.
Two men, moving the portable track.
One man, attending the spreading apparatus.
One boy, attending cables, etc., of the spreading device.

In all, 10 men and two boys, whose daily wage will be about	$20.00
Add to this for fuel and supplies per shift	3.00
Total, to put 75 tons fuel out to dry......................	$23.00
Or, per ton, for labour to put out to dry, about.............	.30
Add for turning and cubing(done by contract)	.17
	.47

Total labour cost ready for storehouse, say fifty cents.

Overhead charges on a capital investment of say $25,000.00, which will cover the total cost of installation, provide a working capital until fuel is on the ground ready for sale, and also purchase 300 acres of bog at present prices, and provide considerable store sheds, including all charges of management, superintendence, office expense, taxes, etc., amount to, in round figures, fifty cents per ton, calculated on a 15,000 ton per year output, making the total cost of the fuel on the field, about $1.00 per ton.

To this must be added from 15 cents to 25 cents to put in the storehouse and on the cars, making the total cost f.o.b. about $1.25 per ton. This estimate is probably about 20% too high.

This figure, however, gives the manufacturer a clear profit of $1.00 per ton, a figure that should satisfy the most exacting when it is noted that an investment of $25,000.00 will provide a 15,000 tons per season plant complete.

Finally, as to the cost of this improved Anrep machinery. It is conservatively estimated that $12,000.00 will cover the cost of the entire moveable plant, including a stationary steam generated electrical plant. A producer outfit would add materially to these figures.

EUROPEAN PEAT SOCIETIES.

By A. Anrep, Jr., Peat Expert, Mines Branch, Ottawa.

The Swedish Peat Society was organized in the year 1886, by Carl Von Freibizen, Director of the Chemical Station in Jönköping.

In the beginning this Society received yearly grants—

From the Government of..............................	$ 4050.00
From the Conservation Commissioners, Office of........	3113.00
From the Provincial Government of....................	2242.00
Total sum of...	$ 9405.00

These grants added to the income received from the members of the Society, from the experimental station at Flahult, from the analyses, etc., making a yearly revenue of $13,500.00.

This money is used, for publishing the Society's Journal, for experimental work in agricultural line, for investigation of peat bogs, drainage of bogs, reforesting the bogs belonging to the different experimental stations, meetings of the Society, etc.

The revenue of the Society has increased so that at present it amounts to $18,630.00 yearly.

The Norwegian Peat Society was organised in Christiania in the year 1902. This same year it received a government grant of $540.00 which has yearly increased. In 1910 the Government grant amounted to $6,400.00, a large sum for the small kingdom of Norway.

J. G. Thawlow is the Secretary and Peat expert of the Society.

The Danish Peat Society was organized in 1866, and received a Government grant of $2700.00.

The Finnish Society in Helsingfors, Russia, was organized in the same way as the above mentioned Societies, and receives the highest Government grant of all Societies in Europe of $16,075.00.

Vereins zur forderung des Moorkultur in Deutschen Reiche, (the German Peat Society) was established in 1882 in Berlin. In 1887 their Society added an experimental stations at Bremen.

At the time the Society was established a Government grant of $750.00 was given. In 1900 the membership consisted of from 600 to 700 members and the

grant was raised to $1000.00. At the present time the membership consists of over 1,000 members and the Government grant has been raised to $5,000.00 yearly.

The German Austrian Peat Society in Munich under the Directorship of Hans Schreiber and the Bavarian Royal Peat experimental station, under directorship of Dr. Baumann, also receive Government grants.

All these Societies are organized on the same principle, more or less. The purpose of a Society should be to advance the important peat question, to develop and advise suitable methods for manufacturing of peat fuel, peat litter, peat coke and other processes if they are found practicable.

Particularly to spread knowledge through lectures, papers, articles, meetings for consultations and suitable means for distributing information regarding the development and cultivation of peat bogs, swamps and mires.

To be able to know how to use different kinds of peat as an improver for agricultural purposes, as well as how to use different kinds of fertilizer for various kinds of peat, to adopt practical methods for cultivation of waste peat bogs, which are not suitable for manufacturing of fuel or for other purposes outside agriculture.

The American Peat Society has been organised on the same principles as the European Societies, but unfortunately this Society has no help from the U.S. Government and has had to struggle hard for its development.

I hope that the Canadian Peat Society which at present is to be organized will flourish and develop above all the sister Societies in Europe and United States. As Dr. Haanel has already stated in his paper to the American Peat Society "We can at present form no estimate of the enormous extent of our peat bogs. The 37,000 square miles already known, form probably but a small fraction of the amount of this valuable fuel asset in existence in Canada."

These enormous extents of peat bogs are not all suitable for fuel, some of them are too shallow, some too small and some not sufficiently decomposed. Peat areas which are not suitable for manufacturing of fuel are probably suitable for peat litter or may be developed into valuable agricultural fields.

A new country like Canada, which is progressing very rapidly and where the population is increasing every day, should take into consideration the conservation question of the enormous waste areas on its continent.

PROCEEDINGS OF THE CANADIAN PEAT SOCIETY.

Preliminary Organization Meeting.

At the close of the Convention of the American Peat Society, held in the Provincial Normal School Building at Ottawa on July 25–27, 1910, a meeting of those present who were interested in the formation of a Canadian Peat Society was held on Wednesday, July 27th, 1910, the chair being taken by Dr. J. McWilliam, London, Ont.

A draft constitution, similar to that of the American Society, was approved and adopted, the name of the organization to be the Canadian Peat Society with headquarters at Ottawa. Officers *pro tem* were chosen to act until the holding of the first general meeting to be held at a convenient date after due notice. The officers thus elected were: President, Dr. J. McWilliam, London, Ont.; Vice-President, L. B. Lincoln, Farnham, Que.; Secretary, Arthur J. Forward, Ottawa, Ont., the gentlemen named constituting the provisional or temporary Board of Directors of the Society.

The annual membership fee was fixed at $1.00, payment of which should entitle members to receive all publications of the Society, and the officers of the Society were appointed a committee, with power to add to their numbers to memorialize the Dominion Government, requesting financial aid towards carrying out the objects of the Society.

The meeting was then adjourned.

FIRST GENERAL MEETING.

Pursuant to notice the first general meeting of the Society was held in the Board of Trade rooms, Ottawa, at 2 p.m., on Tuesday, March 28th, 1911.

The chair having been taken by Dr. McWilliam, the President, notice calling the meeting was read, and the proceedings at the preliminary meeting held on July 27th, 1910, stated by the Chairman. The first item of business being to confirm adoption of the Constitution, a resolution was presented by the Secretary, seconded by Mr. E. V. Moore, Peterboro, Ont., that before proceeding to final adoption of the Constitution, Clause (7) be amended to read as follows: "This constitution may be amended at any annual meeting by a two-thirds vote of the members present."

The amendment was opposed by Mr. L. B. Lincoln on the ground that it would prevent proxy voting, and he stated that he was present holding proxies for about fifty members for whom he demanded to vote at this meeting.

Mr. J. M. Macoun of the Dominion Geological Survey, strongly supported the amendment, and stated that the Canadian Forestry Association, of which he was one of the founders, had found a similar rule to work very successfully. The Chairman ruled that no notice of proxies having been given to the Secretary, or opportunity to verify same, and a resolution being before the meeting at the time they were presented, they could not be considered. Upon a vote of those present the amendment was carried, Mr. Lincoln alone dissenting.

A further resolution was put and carried providing for an Executive Committee of three members to act in conjunction with the officers of the Society, and the Constitution as amended was formally confirmed and adopted.

It was moved by the Secretary, seconded by Edmond Proulx, M.P., and carried, "That the Society tender to Dr. Eugene Haanel the position of Honorary President."

Upon the recommendation of the Board of Directors the following Honorary members were elected:

Hon. Wm. Templeman, Minister of Mines,

Hon. Clifford Sifton, Chairman of the Commission of Conservation, and

Prof. Charles A. Davis, of the Bureau of Mines, Washington, D.C., United States Government Peat Expert.

Officers for the ensuing year were then elected as follows:

President—Dr. J. McWilliam, London, Ont.

Vice-President—J. M. Shuttleworth, Brantford, Ont.

Secretary-Treasurer—Arthur J. Forward, B.A., Ottawa, Ont.

Executive Committee—A. W. Fleck, F. Pedley, John R. Reid, Ottawa, Ont.

A resolution was passed to the following effect:

"That the Board of Directors be instructed to investigate the question of a government bounty on peat fuel, and at their discretion to take such action with regard thereto as may appear to them to be in the best interests of the peat industry."

The following papers were read:

Peat development in Canada.—L. B. Lincoln.

Peat Societies of Europe.—A. Anrep, Jr., Peat Expert, Mines Branch.

The improved Anrep peat machinery.—E. V. Moore, B.Sc., C.E.

Power production from peat gas.—B. F. Haanel, B.Sc., Chief of Fuel and Fuel-testing Division, Department of Mines.

The meeting was then adjourned.

At the close of the meeting the majority of those present visited the Government fuel testing plant, where the production of peat gas in a Körting producer, and its utilization for power to run an ore-crushing plant, was demonstrated and fully explained by Mr. B. F. Haanel and his assistants. This brought the proceedings to a close.

Journal of the Canadian Peat Society.

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EDITORIAL.

For many years past unsuccessful efforts have been made in Canada to utilize the fuel resources lying dormant in our great deposits of peat. Especially was this the case in Ontario and Quebec, which, being without coal measures, are naturally most deeply interested in the matter of economical fuel supplies. The first practical step in the right direction was when the Department of Mines, about four years ago, sent an engineer to Europe to investigate the most successful methods there in use. Following this came the establishment of a demonstration plant at Alfred, Ont., which has proved a pronounced success. When the American Peat Society, of which Dr. E. Haanel, Director of Mines, was then President, met at Ottawa in 1910, a number of Canadian peat men being gathered together at that Convention, the

opportunity was thought a favorable one for the foundation of a Canadian Peat Society. The objects of the Society then formed were stated by the Constitution to be as follows:—

"The purpose of the Society shall be to gather and disseminate information concerning peat and peat deposits and products, by publications, correspondence, conventions, lectures, or otherwise, for the purpose of educating the public as to the value of these products; to encourage the drainage and development of bog and peat lands for agricultural purposes; to gather all kinds of information for publication as to the location, extent, quality and value of such deposits, as to all plants, factories, persons and companies experimenting or manufacturing such products, and as to the various kinds of machines, processes and devices destined or used for such purposes; also to counsel and advise persons seeking knowledge along such lines of work looking towards uses of such products, and generally to adopt such measures as may aid in the establishment on a sound basis of a peat industry in Canada."

In pursuance of these objects it has been deemed advisable to issue a quarterly Journal devoted to the development of the Canadian peat industry.

Members of the Society, and all others interested in the utilization of our peat resources, into whose hands our publication may come, are earnestly requested not only to overlook the defects of the present initial number, but to render their active assistance, by suggestions, correspondence, or otherwise, in making our Journal a source of accurate information, and of encouragement and aid to peat men in general. It will be the endeavor of the management to give fair support without favor to every bona fide effort in the interest of the peat industry. And on the other hand to criticize in a friendly and helpful spirit, whatever may appear detrimental to the permanent success of the industry, and to the establishment of public confidence in this latest movement for the utilization of latent national resources.

FREIGHT RATES.

The success of the peat industry in Canada will largely depend on the cost of transportation of the product to market. Recognizing this fact, the Executive of the Canadian Peat Society have taken steps to bring the matter before the ailway companies. The existing tariff rates are as follows:

PEAT FUEL: Carloads, minimum 30,000 lbs.

Mileage basis to be used where specific tariffs are not in force.

Not over 10 miles	3 cents per 100 lbs.
Over 10 and not over 20 miles	3½ " " 100 "
" 20 " " " 30 "	4 " " 100 "
" 30 " " " 50 "	4½ " " 100 "

Over	50	and	not over	75	miles	....	5	cents	per	100 lbs.
"	75	"	"	100	"	....	6	"	"	100 "
"	100	"	"	125	"	....	7	"	"	100 "
"	125	"	"	150	"	....	8	"	"	100 "
"	150	"	"	175	"	....	9	"	"	100 "
"	175	"	"	200	"	....	10	"	"	100 "
"	200	"	"	225	"	....	10½	"	"	100 "
"	225	"	"	250	"	....	11	"	"	100 "
"	250	"	"	275	"	....	11½	"	"	100 "
"	275	"	"	300	"	....	12	"	"	100 "
"	300	"	"	325	"	....	12½	"	"	100 "
"	325	"	"	350	"	....	13	"	"	100 "
"	350	"	"	400	"	....	14	"	"	100 "

About thirty car-loads were shipped from Alfred to Ottawa last season, a distance of forty-two miles on which the freight rate was 4½ cents per 100 lbs., or 90 cents per net ton. Valuing the peat at the bog at $2.25 a ton, and placing cost of handling from the cars and distribution at 65 cents per ton, this made the cost delivered to the consumer in Ottawa, $3.80 per ton. As the fuel sold at $3.50 a ton, there was clearly a loss involved.

Representatives of the Grand Trunk and Canadian Pacific railways were interviewed with regard to the granting of a lower rate from Alfred to Ottawa, from St. Brigide to Montreal and between other points, and having declined to make any changes in the existing schedule of rates, the Society made an application to the Eastern Canadian Freight Association on July 10th last.

On July 31st the Secretary of the Association notified the Society that "the carriers cannot see their way to publish a basis of rates on this commodity lower than the scale at present in effect."

THE NEWFOUNDLAND PEAT BOUNTY ACT.

According to the terms of an Act passed in 1905 (5 Edw. VII., Cap. 18) the government of Newfoundland grant a bounty of twenty-five cents per ton upon every ton of "machine manufactured" peat fuel produced in the Colony for consumption or export, payment of same to be made to the manufacturers, upon proper evidence, for a period of five years from the date of the manufacturer's first sale. In March, 1911, a further Act (1 Geo. V. Cap. 21) was passed extending the period for payment of such bounty to ten years. Under these Acts all machinery imported into Newfoundland for the manufacture of peat fuel is admitted free of duty. The latter Act excludes from its operation peat fuel manufactured by any Company under special agreement with the Governor-in-Council. Such an agreement was entered into with the government of Newfoundland in March,

1911, by the International Carbonizing Company, controlling a wet carbonizing process. The agreement gives the Company three years within which to examine and locate suitable bogs. Upon selection of same the government agree to grant sites for buildings, etc., not to exceed ten acres in each case. Before calling upon the government to grant any such site, the Company undertake to erect a complete wet carbonizing factory to cost not less than $125,000, and having an annual output of not less than 20,000 tons of wet carbonized peat per annum.

The bogs selected by the Company are to be leased to them by the government under certain conditions for a term of ninety-nine years, the Company agreeing to pay therefor a royalty of ten cents per ton of wet carbonized fuel produced; all property of the Company to be exempt from taxes, and all machinery required to be admitted free of duty for a period of twenty years. The government agree to grant water-powers free of charge, and also use of unoccupied crown lands for temporary purposes. The agreement to be void unless at least one factory is erected and put into operation within three years from the date of the Act.

During the past summer the government have had two Irish experts operating on the south coast, instructing the people in the cutting and preparing of hand made dried peat.

It is reported also that Lieut. Petersen, a Swedish military officer and peat expert spent six weeks examining bogs for the International Carbonizing Company, and decided to advise erection of plants at Gambo and St. George's under the agreement with the government.

PEAT FUEL IN SWEDEN.

A very interesting article on the condition of the peat industry in Sweden in 1910 by Alf. Larson, appeared in the Osterreichische Moorzeitschrift, of May 15, 1911, translated from Teknisk Tidskrift.—Mr. Larson's article was, in part, as follows:—

M. Rahbek, who died in 1910, in his seventieth year, began work on the large bogs at Sparkjaer by a method old in principle but new in its execution. Much time and money were devoted to this work, and the whole district in which the bogs were located became prosperous through the great peat works, M. Rahbek established. It is no exaggeration to say that at Sparkjaer the cheapest peat fuel in the world was made.

In 1910, the weather was no more favorable in Sweden for the production of air-dried peat fuel than it had been for the preceding four years. The power station at Skane, which was a steam plant, depending upon air dried peat to operate, was obliged to have recourse to coal. Under these circumstances it cannot be disputed that the peat power plant on the Körtings' system is surer, since it can utilize peat with over 40 per cent. water content. In Sweden, there are, at the present time, power stations on bogs generating about

2,000 H.P., the largest of which in Gotland, produces 1,500 H.P. According to certified tests there last year, it was shown that the use of peat with an average of 41·7 per cent. water contents and 2,400 eff. calories per Kg. of peat consumption per horse power hour, including all waste, amounted to 1·42 Kg. (equivalent to 0·842 Kg. of dry peat.)

Lieutenant Elekund's process of manufacture of peat powder has attracted a good deal of attention in Sweden during the last year. Favourable opinions on the experimental plant at Back in Smaland have been given by the chief government peat engineers, and others, and wherein the new method differs from the old one, which was in use for fifteen years at Elmhult and produced good peat powder but failed because unprofitable, does not appear from the reports. The principle is the same: the excavated peat is air-dried to about 50% water content, and the greater part of the remaining water removed by artificial means. The novelty consists—it must be assumed—in the drying arrangements, but not being set forth in the reports, is not a matter of public knowledge, and can only be fairly judged by those more intimately acquainted with the process.

In the Teknisk Tidskrift, 1896, there was reported an experiment of heating a steam boiler with peat powder at the Elmhult works. The result was that 1 Kg. of peat powder, containing 17 per cent. water, gave the same evaporation as 0·93 Kg. of Newcastle coal on a grate, which was not surprising since, with powder, especially peat powder, known to give a very great heat, a good air supply can be furnished. The fact remains, however, that the commercial value of a fuel must be reckoned on the basis of its calorific value, and that the burning of peat in powder form does not make it any better in comparison with coal than it was before. Other conclusions are hasty, since a peat powder heating plant (at least as regards existing fire-boxes) is no simpler nor easier to attend than a gas heating plant, and to extract the 50 per cent. of water from the peat, costs no more in a gas-producer than in a drying oven, in fact rather less.

How far the Ekelund peat powder is preferable to ordinary finely divided peat for iron reduction, seems in doubt. The main point in the Ekelund process is its independence of the weather, and the circumstance that the peat is taken from the bog by a mechanical excavator.

Dr. Gustaf de Laval has taken up anew the wet carbonization method with application of entirely new principles. Without going into detail, it may be stated that the wet carbonizing apparatus, the removal of most of the water from the wet carbonized mass, the drying of the latter, etc., are all different from the plans tried on a large scale at Stafsjo in 1905 and 1906. Judging from former experiments, there is justification for the belief that the present researches of Laval will have a successful issue. In the "Bihang till Jarnkontorets annaler" number 11 for 1910, H. Bergström and Otto Tingberg have demonstrated that with the solution containing hydrocarbons, which results when peat is heated

with water under pressure (just as in the process of wet carbonization), a solid product is obtained which contains less carbon than is contained in the original peat, and that therefore the residue of the peat treated is richer in carbon. A real carbonization has therefore taken place, with this difference, however, that instead of a gas containing carbon in its constitution, a fluid is produced which contains carbon. This explains the process of wet carbonization. It may be stated that the purpose of the wet carbonization is not to increase the heating value of the peat, but to render it compressible. On the contrary, it would be desirable that no carbonization should go on with accompanying loss of organic substance in the compressed mass, but for the advantage of easy compressibility one must submit to it. Experience shows that the best results were obtained when the peat mass was heated for a short time, say up to ten minutes, to 180^0 C. The author has carried on experiments which showed that by longer heating at that temperature the carbonization is higher, but the output correspondingly smaller; also that the utility of the peat is less. Still more is this the case when the temperature is raised to 250^0 C.

Since opinions on the peat-supply of Sweden differ widely, it may be of interest to state how much peat fuel the government peat engineers have located in 1901–1909.

In this period they have examined 1,176 peat bogs with a combined content of 33,925 *ha* (83,794 acres). Of these 9,896 *ha* (24,443 acres) are best adapted to peat fuel production, 12,873 *ha* (31,976 acres) to moss litter production, 7,021 *ha* (17,341 acres) for both litter and fuel, preferably the former, and 4,135 *ha* (10,213 acres) are unsuitable for industrial purposes. The fuel bogs are estimated to produce 53,777,835 tons of air dried peat with an average of 5·05 per cent. ash, and 5,140 calories per 1 Kg. The litter moors comprize 336,729,500 M^3 (drained bog) with an average of 1.595 per cent. absorptive capacity. These 54,000,000 tons of peat fuel are about the equivalent of 30,000,000 tons of coal. Since the aggregate area of the bogs of Sweden may be estimated at about 5·2 million *Hektar*, (13,844,000 acres) assuming that the bogs yet to be surveyed, are in quality similar to those already examined, then the unsurveyed bogs contain about 150 times as much peat as those examined and would yield a quantity of peat fuel equivalent to 30,000,000 x 150 = 4,500,000,000 tons of coal which at the present rate of annual consumption would last about 1,100 years.

OPERATION OF GOVERNMENT PEAT PLANT AT ALFRED, 1911.

The demonstration plant erected by the Department of Mines at Alfred, Ont., has had a very successful season's working. According to estimates of the amount excavated, about 2,400 tons of peat fuel, with 25% moisture, were manufactured during eighty-five days of actual working. As the capacity of the plant, which is a small Anrep plant, employing manual labour to a large extent, is estimated at 30 tons per diem, this means that the production has been almost to the full capacity of the machinery. Several hundred tons of peat from this plant were sold in Ottawa and surrounding places last fall and gave excellent satisfaction to consumers. In response to a circular letter issued by the Society about 150 replies were received in which fully 95 per cent. of the writers expressed their satisfaction. The fuel has been again placed on sale this fall in Ottawa, being delivered to consumers at $3.50 per ton. Owing to the serious car shortage great difficulty has been found in delivering the peat to supply orders which had been given in advance to the extent of nearly 1,000 tons.

THE FARNHAM PLANT.

Detailed information with regard to the operations of Peat Industries, Limited, on their bog at Ste. Brigide near Farnham, Que., are not to hand, but from the statement of their manager Mr. L. B. Lincoln, at the Kalamazoo convention of the American Peat Society, the Company manufactured during the past season, about 600 tons of peat fuel, during 27 days of actual working.

PROPOSED COMMERCIAL PEAT PLANT AT ALFRED, ONT.

It is reported that arrangements have been made with the Department of Mines, whereby operations on the government bog at Alfred will be carried on next year by a company who propose to erect an enlarged and improved Anrep plant, with mechanical excavator and other devices, capable of manufacturing about 15,000 tons of air-dried machine peat fuel during the season. It is understood that orders for machinery in connection therewith have been placed, and that all will be in readiness for an early start in the spring. Electric power will be used to operate the machinery and light the bog, and two or possibly three shifts of men will be employed giving practically continuous operation during the season.

which is estimated at about 110 days. A full description of plant and process will be found in the article by Mr. E. V. Moore, engineer for the Company, in preceding pages of this number. Owing to the perfecting of arrangements for harvesting and transporting the manufactured fuel, it is unlikely that the plant will run to capacity during the first season, but a very substantial output is expected. Ready market for the fuel will be found in Montreal, Ottawa, and near-by towns and villages.

MEETING OF AMERICAN PEAT SOCIETY.

The fifth annual convention of the American Peat Society held at Kalamazoo, Michigan, on September 21st–23rd, 1911, was one of the most successful since the inauguration of the Society. Among the important papers read at the meeting were:

The Peat Gas Producer of the Department of Mines, at Ottawa, Canada.—B. F. Haanel, Department of Mines, Ottawa, Ont.

Recent Developments of Peat as a Power Factor.—Dr. T. Arthur Mighill, Boston, Mass.

The Use of Low Grade Fuels.—Prof. F. H. Fernald, Cleveland, Ohio.

Powdered Peat for Power.—Dr. J. McWilliam, London, Ont.

Recent Developments in Peat Machinery.—E. V. Moore, B.Sc., C.E., Peterboro, Ont.

Recent Progress in Peat Fuel Development.—Prof. Chas. A. Davis, Peat Expert, U. S. Bureau of Mines, Washington, D.C.

Peat Outlook in the Northwest,—Max Toltz, St. Paul, Minn.

An Up-to-Date Peat Plant.—L. B. Lincoln, Montreal, Que.

The Mond Peat Gas Producer with Recovery of Sulphate of Ammonia.—Power Gas Corporation, Stockton, England.

Peat By-Products.—Max Klar, Marquette, Mich.

Peat Briquetting.—Geo. M. Mashek, New York.

And a number of papers on the agricultural development of peat bogs.

Mr. Lincoln's paper was illustrated by moving pictures, showing a peat plant in operation near Farnham, Que.

Visits were made to see Mr. Carl Kleinstueck's peat fuel plant in operation, and to the Todd Farm, where a large tract of peat lands worked agriculturally was

inspected. The members of the Society and their friends were very acceptably entertained by Mr. Carl Kleinstueck at Saxonia Farm. Canadians present were:

Dr. J. McWilliam, London, Ont., President, and Mr. Arthur J. Forward, Ottawa, Ont., Secretary of the Canadian Peat Society, Mr. B. F. Haanel of the Department of Mines, and Mr. E. V. Moore of Peterboro.

The officers of the Society elected for the ensuing year are as follows:

President, Dr. Joseph A. Holmes, Director of United States Bureau of Mines, Washington, D.C.; Vice-Presidents—for Eastern States, John N. Hoff, New York; New England States, Dr. T. Arthur Mighill, Boston, Mass.; Southern States, Robert Ransom, St. Augustine, Fla.; Eastern Great Lakes States, Carl Kleinstueck, Kalamazoo; Western Great Lakes States, L. B. Lincoln, Chicago, Ill.; Pacific States, C. V. Jimeson, Los Angeles, Cal.; Canadian Section, Dr. J. McWilliam, London, Ont.; New York Section, Dr. Chas. F. McKenna, New York; Minnesota Section, Max Toltz, St. Paul, Minn.; Executive Committee, Dr. Chas. F. McKenna, Chairman; Julius Bordollo, John N. Hoff, G. H. Condist, John W. Hornsey, Herbert Phillips; Secretary-Treasurer, Julius Bordollo, Kingsbridge, New York City.

The next Convention will be held in connection with the International Congress of Applied Chemistry at New York, during the first week of September, 1912.

PEAT FOR POWER PRODUCTION.

Special attention is directed to the article by Mr. B. F. Haanel in the preceding pages on the results obtained at the government fuel-testing station in production of power from peat. The full report on the operations of this plant, it is understood, has been delayed owing to alterations made during the past summer, from which even better results than those given are expected. The matter of power production is one of the greatest economic importance at the present time. A striking evidence of the interest felt is that representatives of the United Steel Corporation attended the meeting of the American Peat Society held in Ottawa last year, for the express purpose of investigating this matter. Many inquiries have been received by the Department of Mines, and requests for advice as to erection of power plants using peat.

In view of the rapid advance being made along this line in Germany and elsewhere in Europe, where a number of large plants are said to be in successful operation, it would undoubtedly be in the public interest if the Department of Mines were to send an engineer or engineers to investigate these plants and report fully before advising the adoption of any particular plant.

The investigations made in Europe by Mr. Erik Nystrom, which were for the most part confined to the manufacture of peat fuel, have led to such valuable results in bringing the peat fuel industry to a commercial basis in Canada, that the pursuit of a similar course in regard to the equally important question of power production would appear to be not only fully warranted, but almost essential to the best and safest development of the industry.

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ALEPH ANREP, A STANDARD-BEARER OF THE SWEDISH PEAT INDUSTRY.

By Alf. Larson.

(Translated from "Teknisk Tidskrift" January 27, 1912.)

On the 29th day of December, 1911, after many years of suffering, Engineer Aleph Anrep departed peacefully from this life in Helsingborg, Sweden.

He was born in Stockholm, on March 12th, 1845; graduated from Upsala University in 1863; became a Lieutenant in the Svea Lifeguards in 1865, and in the Bohuslan Regiment in 1872. He retired from the regiment the following year, and in 1877 left the army.

In 1868, he became interested in peat, and in 1875-1880 he was employed by "Jernkontoret" (Iron and Steel Institute). During this period he was several times in Germany, where he studied the peat industry.

In 1880 he visited Russia, returned to Sweden, and in 1881 removed with his family to Russia, where he remained until 1900, when he again decided to return to Sweden.

Anrep developed great activity during his twenty years stay in Moscow, and during this time was peat expert for the Iron and Steel Institute, and constructed his first peat machine, which was at that time considered to be the best. The writer saw one of these machines in operation on the Elmhult peat bog, after it had been used satisfactorily for over twenty years. It was during his stay in Moscow that the Anrep machines became superior to other constructions, especially to the German, which up to that time had taken first place.

Hundreds of Anrep's machines were manufactured yearly at the Kolomna Foundry Works near Moscow and at the Briansk Foundry Works near Orel. In 1901, during the writer's visit to Moscow, Arthur Koppel's branch office sold yearly more than a hundred Anrep peat machines.

His first peat machine in Russia was installed for Lebaschoff, Alexander III's Aide-de-camp, greatly to the advantage of his future business.

At the International Peat Machine Competition, 1883, at Bissereva, the Anrep machine received the highest award over eleven competitors representing the leading firms in Europe. In 1897, at the "Nischni-Nowgorad" exhibition, he received the large gold medal. According to reliable information obtained by the writer during his visit in Russia in 1901, over 1,000 Anrep peat machines were then in operation, in addition to 100 duplicated by his competitors. In the vicinity of Moscow alone there were at that time in operation about 500 Anrep peat machines. With a yearly production of approximately 4,000 tons of peat fuel per machine, there was at that time in Russia an aggregate production of about 4,000,000 tons of air-dried peat fuel by the Anrep system.

Up to 1906, Anrep had a considerable income from his business, and on account of his success in the peat industry, as well as for his social talents, he was esteemed by all classes of society, and even moved in the homes of princes. His peat machines spread over the whole Russian empire, from Ural to the Baltic Sea, and from the Gulf of Finland to the Black Sea.

The Anrep peat was used by the Russian sugar and cotton industries, by some of the foundry works, by several private railways, and by many private individuals for domestic use.

But, during his illness, some of the foundry works began to infringe upon his patent rights and manufactured his machines independently. This caused him much worry and loss of money. We know that an inventor has difficulties to overcome in vindicating his rights against infringers in Sweden, and it is even more difficult and expensive in Russia.

Mr. Anrep lost his fortune and partly his income, and in 1896 was attacked by inflammation of the spine as a consequence of which he was paralyzed and confined to his bed for five years. In 1900, he was able to sit up in a wheel chair and from that time on kept himself up until death released him.

As a recognition of his work for the Russian peat industry, Anrep received in 1897 a life pension from Alexander III. Three years ago, during Nicholas Second's visit to Helsingborg, where Anrep resided during the last years of his life, he received on account of his poor health an additional pension, which was a fine and unusual tribute from a monarch to a foreigner.

In 1900, Anrep returned to Sweden to remain. Owing to the length of his absence his machines had suffered neglect, in competition with others of considerably inferior construction; but they began once more to take front rank through his business connection with Munktel's Foundry Works in Eskilstuna, during the continuance of which they were further improved, and a new type of single shaft peat machine was constructed and put on the market.

At the Gefle Exhibition, 1901, Anrep received King Oscar II's Cup of Honour "for successful labours for the advancement of the peat industry."

During the tests of different peat machines in 1904, on the Stafsjo peat bog near Ljungby, which were held at the Government expense and under their control, the Anrep peat machine again received the highest award.

The leading firm in peat machines in Germany, viz.: "Dolberg", in Rostock, made an arrangement with Anrep to manufacture machines according to his construction. Later on he worked in conjunction with Abjorn Andersson's Foundry Works in Svedala, and further improvements were made in details of construction. He also worked out means for transporting and spreading the pulped peat on the field.

Anrep devoted his time in later years to an excavator specially adapted for use on our stumpy bogs. This was the only thing missing to complete the splendid Swedish method of manufacturing air-dried peat fuel. For testing his new invention Anrep received from the Government a bounty of 16,000 kronor, which he later, for certain honourable reasons, had to give up. This construction has now gone to Canada, where Anrep has a son who has devoted himself to the peat industry, and where it will be tried out and perfected on the Canadian peat bogs. It is not impossible that this most important apparatus, after it has been perfected in Canada (as was the case with the Anrep peat machines in Russia), will come back from the other side of the Atlantic to be introduced into Sweden.

During the five years Anrep was confined to his bed in Moscow, he devoted his time also to other inventions, one of which, a life-boat, was tried in Copenhagen, and proved to have certain advantages. For this construction he received a gold medal at Riga in 1902, "the 700 years jubilee."

Anrep also shewed his interest in the peat industry by establishing with the assistance of the Government and other persons, a peat school, at Elmhult, which was afterwards moved to Markaryd.

The Anrep peat machine is without doubt the best in the world. To enter into a detailed description would not be in place here, especially as all who are interested in peat know the main principles of its construction, but I wish to refer to a few points of interest.

The old peat machine had two parallel shafts which rotated against each other. These shafts were furnished with axe-shaped cutting instruments so placed that they together formed parts of a worm. However, they were not solid cast worms, as in competing machines. At the bottom, and on the side near the cover in the body of the peat machine , are placed strong counter-knives which extend as far as the rotating shafts. The ends of these counter-knives form half shaft bearings. The rotating knives meet the counter knives on both sides, so that the former cut like scissors against the latter. Owing to the rotating shafts being enclosed in half shaft bearings, which are formed by the ends of the counter knives, there are no places for roots and fibres to wind up, but they are thoroughly cut up, and are driven by wedge-shaped knives with the peat pulp to the mouthpiece. Besides, there is no gear between the shaft and the pulley, but they are both in one, so that, if a large root or a stone should chance to come into the machine with the raw peat, which usually causes an immediate violent resistance, the only result will be that the belt slides off the pulley, and the peat machine does not break. During Anrep's

connection with Munktell's the machine was further improved and made with a single shaft, lowering its cost, and rendering the construction more solid.

The writer saw a fish-plate which accidentally came with the peat into a machine, receive such a cut that it was not far from being divided in two. The belt slipped off the pulley, the machine stopped, and no part of it was injured,—not so much as the knife that made the cut. It can be said without exaggeration that the Anrep machine is a masterpiece of construction and receives too little attention.

Owing to his untiring energy and natural talent, Anrep was a skilful inventor and a man of unusual ability. He was cool and clear-headed, and was never carried away by the enthusiasm of an inventor to make exaggerated statements, or to be careless in his constructions. As proof of his energy may be cited that, although he was paralyzed for seventeen years—confined to his bed for five years, and to his chair for the remaining twelve years of his life—during all this time he worked constantly as a constructor and inventor, and, in spite of his great physical sufferings, had himself carried out to the bogs, where he could personally supervise the working of his machines.

He had his failings, as everyone has, but they were the more excusable in him on account of his many merits. All who learned to know him could not help but see in him a real gentleman. He was a native of Sweden, and made Swedish technical work known and respected throughout a large part of the world.

Peace be with him.

Alf. Larson.

EUROPEAN PEAT SOCIETIES.

Written for the Journal by Dr. Hjalmar von Feilitzen, Director of the Swedish Peat Society, Jönköping, Sweden.

At the first general meeting of the Canadian Peat Society, Mr. A. Anrep, Jr., read a paper on European Peat Societies, which has been published in the Journal of the Society, No. 1, pp 23-27. As this account is somewhat imperfect, and contains some errors, I trust I may be permitted to make some corrections, and add some further facts.

As to the *Swedish Peat Society* (or, as literally translated, The Swedish Society for Cultivation of Peat Land or Peat Bogs, —Svenska Mosskulturforeningen), the name of its founder is Carl von Feilitzen, Director of the chemical and agricultural experiment station in Jönköping, The total yearly income of the Society has increased to $14,603.20 in 1910. The Society has its home in Jönköping, where it owns an Institute, with chemical and botanical laboratories, a Museum with extensive collections of objects related to peat culture and peat as litter, fuel and for other purposes, and offices for the Director and his assistants, and also an experimental garden for pot and plot experiments with peat soil.

Then the Society has two experimental farms, the one at Flahult, seven miles away, and the other at Torestorp, fourteen miles from Jönköping, where agricultural experiments on peat soils have been carried out on a large scale. Finally also, smaller field experiments have been made in different parts of the country. In 1910 there were sixty-five such experiments in eighteen provinces.

In the laboratory peat for litter is tested as to its absorbent power, and peat fuel with regard to its heating energy (with calorimeter); as well as peat soil for its value for agricultural purposes.

Upon the staff of assistants there are three consulting engineers or experts, who give advice to the owners of peat bogs as to their value after investigation and taking of samples; and the botanist and geologist of the Society is every year making extended investigations of the bogs in different parts of Sweden. Many experiments and investigations into the industrial uses of peat have also been made. In the Journal of the Society, which is issued six times yearly (ca 500 pages), and at the meetings, held twice yearly, there are read and published papers on the uses of peat and peat bogs for both agricultural and industrial purposes.

The *Norwegian Peat Society* (Det Norske Mysrelskap) in Kristiania, has the same objects as the Swedish Society. It has an experimental farm at Maeresmyren, and at present two consulting engineers or experts, one Mr. Thaulow, for the

industrial, and the other, Mr. Lende-Njaa, for the agricultural side ~~of the develop-side~~ of the development of peat lands. During the present year there will probably be engaged two assistants, one for each division. The Society publishes a Journal six times yearly.

Mr. Anrep is at fault in his statement regarding the Peat Societies of *Denmark*. There has existed in Denmark since 1866, a Society for forest culture on the waste heaths in Jutland, called "*det Danske Hedeselskab*", now at Wiborg. That Society, in 1888, added to its program the cultivation of peat bogs, and has two experimental farms, and a great many small fields on peat lands. The government grant for the agricultural section was in the year 1907, together with the incomes from the farms, $25,309.83. The Society publishes a monthly Journal.

In 1901, there was founded by M. Rahbek and others, a Society called "*Moses-elskabet*", specially devoted to advancement of the industrial uses of peat, which, in 1908, received a government grant of $2,175, and published a Journal called "*Mosebladet*", which was issued six times a year. But, in 1910, that Society became affiliated with, and now forms a special division of the Danish Heath Society. The Managing Director of the division is Dr. A. Mentz.

The *Finnish Peat Society* (Finska Mosskulturföreningen) in Helsingfors, Finland, was founded in 1895. It publishes a year book comprised of two or three volumes each year, and has two experimental farms. The President and Director of the experiments is the well-known Professor A. Rindell, who has associated with him a botanist, a chemist, and several agricultural experts.

In *Russia* great efforts have been made of late years to rouse interest in the peat question. The Russian government has sent many young engineers to other European countries to study the culture of peat bogs and the peat industry, many of whom have studied for a longer or shorter time in Jönköping. They will now engage for every province (county) one, two or more experts in cultivation of peat lands. This year there will be established at *Peterhof*, the experimental farm of the polytechnicum in Riga, a special course for students of peat land culture.

Two years ago there was organized the *Baltic Peat Society* (Baltischer Moorverein) at Dorpat for advancement of peat culture in Lifland and Estland. Its Manager is Dr. A. von Vegesack. This Society has an experimental farm at Thoma, and publishes a Journal (Mitteilungen).

In *Germany* the study of peat and peat culture has been going on for many years. The *Prussian experimental station for peat culture in Bremen* (Moorversuchstation) belongs to the government, and was founded in 1877. Its first Director was the famous Professor Dr. Fleischer, and Professor Dr. Tacke is now at its head. The station has a big Institute with modern chemical and botanical laboratories, and also an experimental farm at Tostedt in Königsmoor, and many smaller fields. They are working chiefly on the agricultural exploitation of the peat bogs.

The *German Peat Society* (Verein sur Förderung der Moorkultur in Deutschen Reiche) in Berlin was founded in 1883. It publishes a Journal (*Mitteilungen*),

in 24 parts yearly, holds a general meeting every year in Berlin in February, and has small experimental fields, meadows and pastures, on peat bogs. Its Secretary is M. Jablonsky. In October, 1911, a division of the Society was formed, specially devoted to advancement of the peat industry, with Dr. Wolff as Director.

In other parts of Germany the provincial governments have formed divisions for study of peat culture, as in Pommern, where they have a large experimental farm at Neu Hammerstein with M. Freckmann as Director, in Posen, Ostpreussen, Oldenburg, Mecklenburg, and elsewhere.

In *Bavaria* the government founded in 1895 an Institution of its own for peat and peat culture (Königlich Bayerische Moorkulturanstalt), under the directorship of Dr. A. Baumann, Munich. They have chemical and botanical laboratories, five experimental farms and many small fields. The Institution publishes Mitteilungen and a year book.

In *Austria* the government established in 1901 at the imperial *experimental station at Vienna* a division for peat culture and peat industries (Abteilung für Moorkultur und Torfverwertung der K. K. lander Versuchs-station, Wien). The Director is Dr. W. Bersch. To it belongs, also, the experimental farm at Admont in Steiermark. It publishes a Journal called *Zeitschrift fur Moorkultur und Torfverwertung.*

The *German Austrian Peat Society* (Deutsch Oesterreichischer Moorverein), founded in 1900, has its site in Staab, Pilsen, in Bohemia, and its Manager is Mr. Hans Schreiber. It has an experimental farm at Sebastiansberg, where is also to be seen the interesting Peat Museum, and it publishes a monthly Journal (*Oesterreichische Moorzeitschrift*).

Lastly, I will add the communication, that at the Polytechnicum in *Hannover* there has been established a chair for lectures on peat industry, beginning in November 1911, under direction of Professor Dr. G. Keppeler.

POWER FROM PEAT.

(Reprinted from "The Engineer," London, Eng., Dec. 8th, 1911).

A peat power plant has been working at the factory of Mr. Hamilton Robb, at Portadown, since the early part of September, with, we are informed, entirely successful results. The plant, which has a capacity of 400 brake horse-power, consists of two gas producers, each of 200 brake horse-power capacity, coke scrubber, tar extractor, sawdust scrubber, exhauster and expansion box.

Mr. Robb has always had a firm conviction that, sooner or later, he would be able to run his factory with peat from his own boglands at Magherty, as fuel. About eighteen months ago, he accordingly discussed the matter with Mr. Pegg, of the firm of T. L. Miller, Wilson and Pegg, consulting engineers, of Belfast, Liverpool, and Manchester, and it was decided to send some four tons of peat from the Magherty boglands to Crossley Brothers, Limited, of Openshaw, for experimental purposes. Mr. Pegg had had some experinece in the use of peat for th's purpose, having, as long as six years ago, succeeded in running a factory, of which he was then works manager, for some ten days on peat gas. He had encountered a number of difficulties, and these, with the active co-operation of Messrs. Crossley, he set himself to overcome. A test was run with the experimental plant at Openshaw in December last, and the result was deemed sufficiently satisfactory for Mr. Robb to be advised to install a 400 horse-power plant for his factory. The result was not achieved without it being found necessary to make sundry alterations in the design of the apparatus, as the experimental plant had not originally been designed to deal with peat; but these matters were satisfactorily settled by Messrs. Crossley and Mr. Pegg, and the plant was put in hand and delivered in August last.

Its operation is extremely simple. The peat is fed by hand into hoppers at the top of the producer, from which it falls by gravitation into the body of the producer as combustion of the lower layers of peat takes place. The gas as it is formed passes through the coke scrubber to the tar extractor, where the tar is separated from the gas by centrifugal action. The gas then passes to the sawdust scrubber, where the final cooling and cleaning take place. It is drawn through the plant by an exhauster in the form of a high speed fan, which delivers it to a gas-holder for use in the engines.

The nature of the gas produced is similar to that of suction gas from Welsh anthracite, though it contains a smaller percentage of hydrogen gas, and the thermal value is slightly more—about 140 B. T. U.

The peat fuel is cut from the boglands at Magherty and dried by the ordinary open-air method. In this way the peat which originally contains about 85 per cent. of moisture, can be dried during an average drying season to contain about 26 per cent. of moisture. During the last exceptional summer the peat was actually dried in the open air to such an extent that it contained as little as 19 per cent. of moisture, as shown by chemical analysis. The plant, however, is designed to work with peat containing up to 45 per cent. of moisture, though naturally it would not be so economical to use peat in such a wet state, because, for one thing, of the excessive cost of carriage in proportion to the effective fuel contained in it. It is interesting to know, however, that the plant will work with such wet peat, for the climate of peat-producing countries is very rarely dry.

The cost of the peat as delivered on the site at Portadown, is 6s. per ton, and the amount of peat consumed per week with an average load on the plant of 275 brake horse-power is slightly under twenty tons. The prime cost of the fuel is

therefore £6, but from this must be deducted the value of the tar recovered from the plant, which averages 35s. per week, which leaves the net cost of the fuel at £4, 5s. We are informed that the factory engines were, previously to the introduction of the peat plant, driven by a coal gas plant which used 8½ tons anthracite per week at a cost of £13, 16s, 3d. With the peat plant, as it is worked at present, one more labourer is required than was found necessary with the anthracite plant, but it is thought that it may be found possible to dispense with this additional labour later on; but allowing £40 per annum for additional wages, the saving effected in the cost of fuel in a factory which contains 500 looms and employs from five to six hundred hands is well over £400, as shown by the above figures.

As regards the working of the plant, the anthracite plant has been kept as a stand-by, and although we gather that it is not now ever called upon, it was found very useful in the early stages of handling the peat plant and before the men got used to the latter. The initial difficulty was in learning how to control the amount

of gas made, as sometimes it was altogether in excess of requirements, and other times it was entirely insufficient. One of the earliest troubles was experienced from a very unexpected cause. Owing to the exceptionally dry summer, the peat which had been stacked to dry near the shores of Lough Neagh had become considerably inpregnated with sand blown from the shores of the Lough.

This sand collected on the grate bars of the producer in the form of a crude black glass, which blocked up the interstices completely and stopped the generation of gas. This trouble was quickly cured by adjusting the amount of air admitted between the bars, and by introducing a certain amount of water vapour into the main air supply to the producers, and no further trouble has been experienced from this cause.

When the plant was originally put down it was arranged to cut the peat fuel into blocks of about 5-inch cube before feeding it into the hoppers. This procedure being found troublesome and expensive, the feed hoppers were altered and the peat is now fed in blocks exactly as they come from the boglands.

The only other trouble experienced has been in connection with the coke scrubber. As the gas passes through this before it reaches the tar extractor, a large amount of tar was thrown down on the coke, especially on the bottom layers, and the scrubber became so rapidly choked that it required attention every five or six days. Eventually the scrubber was modified so as to act as a washer and cooler, the major portion of the coke being removed, and the gas being made to pass upwards against a descending shower of water. The removal of the coke had a double advantage, inasmuch as not only was the initial expense of the material saved, but more tar was thrown out by the tar extractor instead of being deposited in a worthless condition on the coke.

The amount of tar recovered is about 5 per cent. of the weight of the fuel consumed, or say, one ton per week. It is all being sold, and is at present realizing about 35s. per ton. The tar, on analysis, was shown to contain a slight amount of paraffin wax, and a considerable proportion of heavy oils distilling about 270 deg. Cent.

We have been supplied with a copy of an analysis of the tar, which was made by Messrs. Totton and Hawthorne, analytical and consulting chemists, of Belfast, and we reproduce it below:

Sample of Tar No. 1.

On distillation the following fractions were obtained:—

1. Water	49.7	per cent.
2. Light oils (distilling below 230 deg. Cent.)	5.8	"
3. Middle oils (distilling at 230–270 deg. Cent.)	8.0	"
4. Heavy oils (distilling above 270 deg. Cent.)	19.4	"
5. Coke (left in retort)	10.3	"
6. Loss	6.8	"
	100.0	

Much frothing occurred during the distillation owing to the large amount of water present. The final temperature registered by the thermometer was 325 deg. Cent.

The same analysts have also analysed the peat itself, and we give below a record of the results they arrived at:

Sample of Peat.

Received on 14th September from Mr. Hamilton Robb, Portadown
Proximate Analysis:

Water	18.98	per cent.
Volatile matter	55.17	"
Fixed carbon	24.75	"
Ash	1.10	"
	100.00	

Ultimate Analysis:

Carbon	44.60	per cent.
Hydrogen	5.42	"
Nitrogen	0.97	"
Ash	1.10	"
Moisture	18.98	"
Oxygen (by difference)	28.93	"
	100.00	

This plant, which is claimed to be the only instance in the British Isles of the direct commercial utilization of peat for power purposes, is now working daily, and giving no trouble whatever. The only operations required are the stoking of the plant and the cleaning of the ashpits. Owing to the open nature of the fuel, it is found that no "poking", such as is necessary with coal plants, is required, which, of course, simplifies the operation of the plant.

BULLETIN 16 OF UNITED STATES BUREAU OF MINES.

The Uses of Peat for Fuel and other purposes, by Chas. A. Davis, Bulletin 16, Department of the Interior, Bureau of Mines, Washington, D.C., Government Printing Office, 1911.

Under the above title a very comprehensive text-book on peat has been recently issued by the Bureau of Mines at Washington. Professor Davis in his usual lucid manner deals with widely diverse subjects covering the whole range of matters of special interest to peat men. A few of the chief headings will give some idea of the scope of the work, viz.: Origin and formation of peat ; Physical and chemical properties of peat as related to its fuel value ; Preparation and manufacture of peat fuel ; Manufacture of gas from peat ; Peat as a raw material for products other than fuel ; Agricultural uses of peat ; Tables of analyses ; Selected bibliography on peat. This bulletin will be welcomed as a distinct and valuable addition to the literature on the subject. Applications for copies should be directed to Joseph A. Holmes, Director, Bureau of Mines, Washington, D.C.

Following are a number of extracts selected from Prof. Davis book.

Policy for Development of Peat Industry.

"As yet no peat-fuel industry can be said to exist in the United States, although much experimental work has been done, and great sums of money spent to establish one. . . .

The peat-beds are a great and neglected resource which, when properly and fully developed will add to our national wealth no inconsiderable quantity of good fuel and of raw material for important arts and manufactures. The discussion will, of necessity, be devoted largely to the uses of peat in European countries, and to the methods of securing marketable products in commercially paying quantities there. Only by carefully considering these can the mistakes and failures of the past be avoided and improvements of existing processes made. . . .

The foundation of all successful development and growth of peat industries in the United States must be a thorough scientific study of the occurrence, nature, qualities, and peculiarities of peat itself, and a careful and honest investigation of the status of these industries in the European countries in which they have reached self-supporting existence. To begin without these preliminary studies would be the height of folly."

(Ed. Thanks to the foresight and energy of Dr. Haanel, Dominion Director of Mines, the policy thus outlined for the United States by Prof. Davis, their leading peat expert, has been already inaugurated in Canada. The sending of Mr. Erik

Nystrom to investigate European methods of peat fuel production, and the subsequent installation of the Anrep machine peat fuel plant at Alfred, Ont., have already borne fruit in the direction of installation of commercial peat fuel plants in Canada. This Society has recently urged upon the Minister of Mines the advisability of further examination into the production of power and by-products from the gasification of peat, as now practised in Europe, and it is hoped that this investigation will be undertaken by the government at an early date.)

General Conclusions on Peat Fuel.

Fuel Value.

" The fuel value of peat as compared with that of coal and wood for firing boilers, furnaces, and stoves has already been discussed at length. The facts presented would seem to demonstrate that although plainly inferior to the best coal in the number of heat units yielded per pound consumed, nevertheless, if prepared in the ways commonly used in Europe peat fuel presents so many desirable qualities, such as freedom from smoke, cleanliness in handling, small ash content, complete and easily controlled combustion, and prospective low price, that there should be a good field for its introduction for manufacturing and domestic uses in those parts of the United States where peat naturally occurs in abundance.

Utilization of Deposits.

There are many small bogs in the peat-bearing regions of the country which, although too small to warrant the establishment of large plants for the production of fuel, could be utilized to furnish machine peat enough for boiler fuel for a single small factory for many years. They might also furnish the power to pump water and generate electricity for a small community for an equal length of time.

The principal matter to be borne in mind in preparing to exploit a peat deposit in such a way is that the simplest equipment which has proved it can yield the desired quantity of usable or salable fuel is the one most likely to give satisfactory returns either in fuel or money. Every added process of treatment beyond that which is necessary to put the peat into usable form for a specific purpose adds many times to the first cost of equipment and to the practical difficulties of making a product that can be sold for enough to pay the costs of preparation and of putting it on the market at a profit.

Producer-Gas Plants.

The present state of knowledge seems strongly to indicate that large peat deposits can be most profitably utilized, and the largest percentage of the stored-up energy in them recovered as power, by converting the peat into producer gas and using this gas in properly designed gas engines. The power may be used by factories operated on the spot, or as electric energy may be used at a distance. Large plants, by using by-product gas producers and thus at least recovering as

ammonium sulphate the ammonia that is formed during the destructive distillation of the peat, may be able from sales of the sulphate to pay a part of the expenses of the whole operation. The by-products process, however, may not be feasible for gas-producer plants of small size, because the costs of installation, maintenance, and supervision are proportionately higher for small than for large plants, and the quantity of by-products obtainable from a small gas producer is not sufficient to keep a recovery plant in operation continuously.

Even without any by-products the use of producer gas presents so many advantages that wherever peat beds are to be used as sources of fuel for power installations of more than 100 horsepower, the possibilities of a producer-gas plant should be given serious consideration.

The producer-gas plant may also be readily adapted to metallurgical work, to firing kilns for brick, porcelain, lime, and probably for cement manufacturing. It might have a large use in roasting ores and, in a small way, in foundries and other iron-working plants, and in reheating and refining steel, copper, and other metals when fuel free from sulphur is required.

Even for boiler plants that could use peat fuel, a gas producer would be a most desirable adjunct, as it would permit the use of peat less carefully prepared and containing more water, and the economy would be greater than in any other way of firing.

Peat Powder.

Next to producer gas, peat powder is the most attractive form of fuel for firing boiler furnaces, for operating kilns of various sorts, and for the metallurgical operations mentioned. This form of peat fuel has not yet been so generally used in Europe as has producer gas, and not as much has been demonstrated commercially in regard to its value. The most recent reports are very favorable and indicate that peat powder can be cheaply produced and is as good fuel for boiler firing when properly prepared and fired as the same weight of good English coal.

Domestic Uses.

The steadiest and, in the aggregate, the greatest demand for peat fuel may be expected to come from small consumers who want a clean, easily handled, and cheap fuel that gives out a steady heat and yet responds quickly to changes of draft when burned in ordinary heating and cooking stoves. Doubtless in this way, as a supplementary and auxiliary fuel, much of the peat that is gathered for fuel will be used.

Peat Coke.

Peat coke is the most efficient solid fuel derived from peat, but its high cost of preparation will doubtless limit its use even more than that of charcoal is now limited. Its value for all uses to which charcoal is now put should find it a ready and satisfactory market after it has once become known to the industries that require such a product."

THE PEAT INDUSTRY IN HOLLAND.

(Translated from a Report of the Royal Minister of Agriculture, Industry and Commerce for the Netherlands.)

Until recently, peat has remained the real national fuel of the Netherlands. Formerly it was used as the principal fuel in various branches of industry, especially in brick and tile works, breweries, glass works, etc. It is still used to supply the furnaces of the factories of the peat-works district of Groningue.

As a result of the long continued use of peat, vast areas of bog, which may be classified as high (drained) and low (undrained) bogs, have been cleared of peat. On the drained bogs, lands which were formerly sterile wastes have become fertile fields, for beneath the covering of peat there is generally a soil, called in Dutch "dalgrond", which is especially adapted for agricultural purposes.

The province of Groningue presents a remarkable example of this. Peat has been systematically taken out there since the sixteenth century, so that to-day almost all the bogs have been cleared, bringing to light the fertile lands which they covered. Potatoes and wheat are now cultivated there, furnishing the raw materials for the starch and straw-board factories. The canals which were formerly dug for the "Veenkolonien" (colonies of peat works), and which are still kept in perfect condition, have greatly favored the development of these industries. The total length of these canals in the three northern provinces is 1562 km.

In the lowland bogs the excavation of the peat has formed basins of water which can be drained later, producing also fertile lands. The exploitation of the

peat bogs has thus greatly contributed to the improvement of the soil of the Netherlands.

The removal of peat from the upland bogs is still being carried on. The following table shows the number of hectares which have been cleared in the last five years, and the extent to which the "dalgrond" has been transformed into arable land.

Year.	Drained bogs worked.	Exhausted and converted into arable land.
	hect.	*hect.*
1905	599	709
1906	469	575
1907	527	520
1908	340	545
1909	364	441

(1 hectare = 2.7 acres).

On the high bogs there is produced a sort of peat called "long peat". The principal districts where this is produced are the east part of northern Brabant, called "De Peel" (Helenaveen and Griendtsveen), the eastern portion of Drente (Emmen, Dalen, Borger, Hoogeveen, Schoonebeek, Westerbork and Smilde), and the eastern part of Overysel (Hardenberd, Gramsbergen and Ommen.)

The approximate production of "long peat" in these provinces is:—

"De Peel"	100	million	pieces
Drente	1,200	"	"
Overysel	300	"	"
Other provinces	200	"	"
Total	1,800	"	"

representing a value of about 6½ million florins ($2,613,000).

The low bogs produce chiefly "short peat", the preparation of which calls for a series of operations. Low bogs are found and worked in almost all the provinces, but particularly in southern and northern Holland, and the provinces of Utrecht, Frise, Overysel and Drente. The annual production of "short peat" is about 700 million pieces, divided as follows:

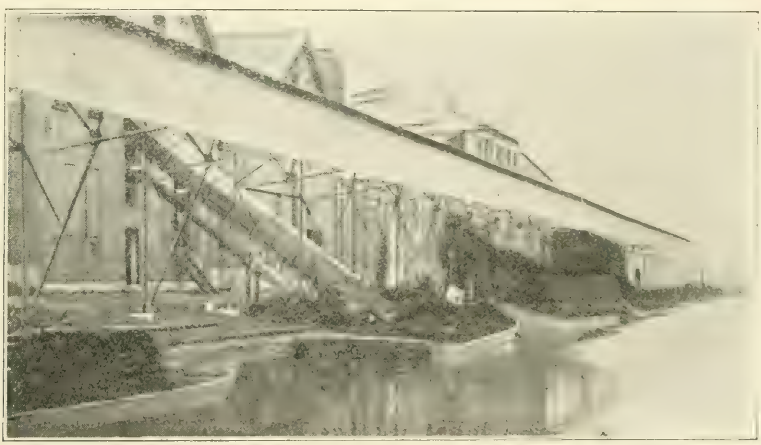
Holland	200	million	pieces.
Drente	150	"	"
Overysel	120	"	"
Other provinces	230	"	"

The commercial value of this peat on the ground is 1½ million florins ($603,000).

The market for peat is entirely domestic.

Besides the manufacture of peat by the old methods, there has been developed in the last thirty years a new industry, namely, the production of peat litter, of which various uses are made. The light porous peat of clear brown colour, which covers the surface of the bogs to a depth of 0.50 to 1.50 metres, serves for the manufacture of peat litter.

This work is carried on in factories of which a great number belong to the peat works exploiting this particular sort of peat, and also receiving their raw material from other bogs. The principal peat works possessing at the same time such a factory are located in the southern part of northern Brabant and the western part of Limbourg (Deurne, Asten, Griendtsveen and Helenaveen), where especially a commune and some large associations are engaged in this business; in the north-



Moss Litter Works at Griendtsveen

east part of the country (Groningue, Drente and Overysel) Dedemsvaart, Hoogeveen, Klazienaveen, Nieuw-Amsterdam, Oranjekanaal and Vroomshoop. The coverings of light turf gradually disappear in Northern Brabant, and for this reason a company which has established factories at Drente on its own bog has great difficulty in maintaining production.

In the factories the peat is ground, dried in the open air by sun and wind, and then compressed in bales of 100 kg. Some of the factories also produce from "short peat," briquettes which serve the same purposes as lignite briquettes.

The use of peat moss litter is growing, and in many cases, particularly in stables, it takes the place of straw. Even recently in spite of the decrease in employment of horses for traction purposes, and their replacement by mechanical traction, the demand for moss litter is steadily growing.

The agricultural use of peat litter is also increasing particularly to cover plants and fields of bulbs.

Mixed in certain proportions with molasses, peat furnishes an excellent cattle food, for which there is a very considerable demand. Peat serves also for the packing of fruits (especially tomatoes).

From the fact that peat litter has such diverse uses, the annual production of the Netherlands (now about 200,000 tons) is always increasing. Only about a tenth of the output remains in the country. The remainder is shipped to England, France, Belgium, America, and Germany. A small quantity is sent to Spain. The export business is carried on chiefly from Amsterdam, Rotterdam and Harlingen. The exportations to France and Belgium go by rail.

STORING MOSS LITTER FOR SHIPMENT AT ROTTERDAM

PEAT INDUSTRIES LIMITED,

Operating near Farnham, Que.

The work done last season by The Peat Industries, Ltd., while satisfactory in point of production, was more in the nature of pioneer work. Before operations could be commenced in the spring the bog had to be prepared, ditching had to be done, the drying field cleared, and machinery brought in etc., etc.

The main ditch, which is ten feet deep, seven feet wide at the top, and three feet at the bottom, is twelve hundred feet long. The ditching for the surface drainage, of which there is between seven and eight thousand feet, is not as deep or wide as the main ditch, being but three feet deep by about two feet wide.

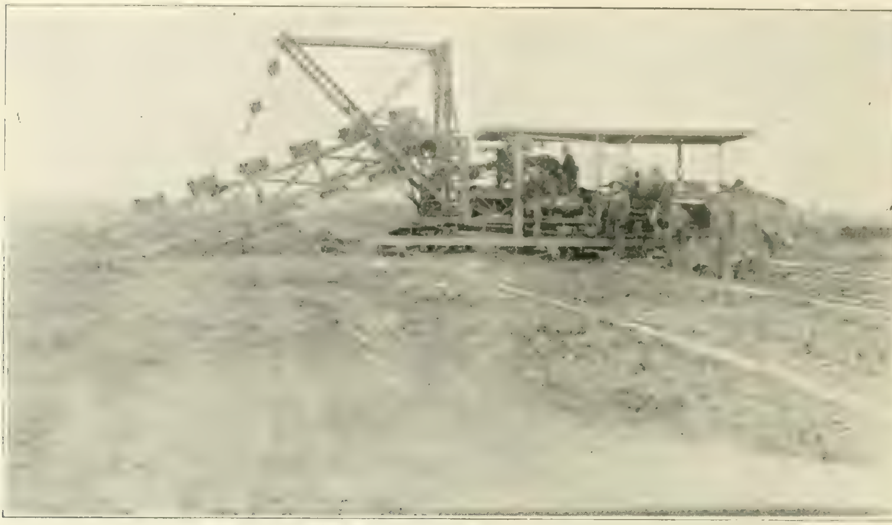
Peat Fuel Works and Shipping Platform

Owing to the bog having previously been undrained, the peat excavated during the season ran high in moisture content, the average sample running from 90 to 92 per cent.

The season for advantageously manufacturing Peat Fuel, was almost over, by the time the Company succeeded in having their machinery delivered and set up, after which there was a certain amount of experimental work carried on in order to perfect the system.

A word about the system used by this Company, might be appreciated. Although it is practically the Swedish System it has been modified to meet the re-

quirements of this country. The whole machine is mounted on one platform, which in turn is mounted on wheels of the caterpillar type by which means its weight of approximately thirty tons is distributed on the bearing surface of the bog, giving a pressure of three pounds to the square inch. On the forward part of the platform is mounted the 50 H. P. gasoline engine from which is derived the power that operates the excavator, the macerator, the delivery system, and also moves the whole machine from place to place as required. In the middle, some-



Excavator and Macerator

what to the left of the platform, is placed the macerator, which works into a pulp the raw peat that has been received from the excavator. After thorough maceration this pulpy mass is carried through a spiral conveyor, and delivered to the waiting dump cars. The big excavator boom is situated on the rear end of the platform. On it are mounted bottomless buckets each attached to the other, making an endless chain. This excavator digs a ditch twenty feet wide by ten deep, and under favorable circumstances has a capacity of one cubic yard per minute.

When the dump cars, mentioned as being loaded by the spiral conveyor, are ready, they are clamped to an endless cable which draws them out to the drying field, and eventually empties into the field press, which also travels by endless cable and which spreads out evenly the prepared peat, and cuts it longitudinally by means of revolving disks. The power for hauling the cars, and also for the field press is derived from the engine on the machine.

After the peat has been spread and cut longitudinally it is cut crosswise, by a man who follows the field press and is armed with a double revolving disk for doing the work. When the briquettes have dried somewhat they are turned over, and

after a still further drying are stacked in small pyramids in such a way as to allow a free passage of air to continually circulate between.

When ready for shipment, the loader comes along with a large metal basket which he inverts over the stack. Then by a quick turn the basket is righted, and will be found to contain all the peat of the stack, which is then thrown into the cars to be carried from the drying field to the shipping point.

This process of handling the prepared peat, was found to be the one weak point, where the cost was all out of proportion, and to remedy it the Company have had their engineers working on plans during the past winter. The result is that dump cars of a special design are being built, rails for a permanent railway are being laid, and locomotives of the internal combustion type are to be used to draw the trainloads of finished produce from the drying field to the point of shipment. The locomotive will draw the cars up on the shipping platform, from whence they are dumped directly into the regular railway cars. The new shipping platform is built sufficiently large to allow the loading of three cars simultaneously.

The prospect of a market for the fuel manufactured, is one of the least things to be considered. Of last years product, not one ton remained unsold, and what speaks well for the quality is that wherever it was used, enquiries are coming in daily for supplies for 1912. One industrial concern who with the greatest doubts gave it a trial last year are now discarding anthracite coal entirely and substituting peat.

Should the season of 1912 be a favourable one for the manufacturing, peat will be introduced into our daily life, more than ever before, and through it we can become at least in a measure freed from the leash of the Coal Baron.

Journal of the Canadian Peat Society.

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EDITORIAL.

Since the appearance of our last issue one of the most prominent figures in the peat world, Engineer Aleph Anrep of Helsingborg, Sweden, has been removed by death. For the past thirty years or more Mr. Anrep's name has been a household word among peat men the world over, and he has left his impress upon the industry in many countries outside his native Sweden. When the Mines Branch investigated conditions governing the production of peat fuel in Europe four years ago, the Anrep peat machine was selected for demonstration in Canada as the best available, and a small plant was installed at Alfred, Ont. The successful results of that installation are well known, and have led to the proposed erection this season, by private capital at Alfred, on a portion of the Government bog, of a much

larger plant, including the new mechanical excavator devised by Anrep. We print in this number a translation of an appreciative article on Mr. Anrep's life and work, written for the Swedish engineering Journal, "Teknisk Tidskrift", by Mr. Alf. Larson, who is himself among the leaders of the peat industry in Sweden.

Our readers will peruse with interest the important article on European Peat Societies which has been kindly contributed to the Journal by Dr. Hjalmar von Feilitzen, Director of the Swedish Peat Society. On this continent also, there is evidence of an awakening, not only to the value of the resources lying neglected in our peat bogs, but to the necessity for thorough and scientific study and research, if our efforts to develop these resources are to be rewarded by financial success. This is only possible through organization and exchange of ideas and experiences, which will lead to the sifting out of the wheat from the chaff. The Dominion government has already taken substantial action in the way of aiding such co-operative study and investigation by making a grant of $1,500 to the Canadian Peat Society for carrying on educational work. And it may be expected that the governments of the Provinces as well, will be ready to assist in any well-considered plans for the advancement of the peat industry.

We republish from "The Engineer", London, England, a short description of a peat gas producer power plant at Portadown, Ireland. This installation, made by the well-known firm of Crossley Brothers of Manchester, will be particularly interesting as indicating the possibility of profitable utilization of comparatively small bogs in production of power, where such power can be locally used to advantage.

Two publications of official character which have recently appeared are the Report of the Royal Minister of Agriculture, Industry and Commerce for the Netherlands on the peat industry of Holland; and the Bulletin on peat written by Prof. Charles A. Davis and issued by the United States Bureau of Mines. This latter is quite comprehensive in its scope, and we have attempted no more than to make a few excerpts shewing the general policy advocated for the United States by Prof. Davis, and his general conclusions on the subject of peat.

Owing to the fact that the season was far advanced before the new plant of Peat Industries Limited was fully installed at the Farnham bog, and considerable experimental work was done during the summer, the Company are not yet in a position to make public any detailed statement of their operations. The plant is in charge of Mr. Gus. E. Carlsson, a man of recognized ability and experience, and results of the coming season's work will be awaited with much interest.

It may now be definitely stated that the operation of the Government Peat Plant at Alfred, Ont., will not be continued during the coming summer. Under an agreement made by the Department of Mines with private parties, the latter have been given permission to erect, on a portion of the government bog, a large plant, equipped with mechanical excavator and other improvements, which will be built and operated entirely by private capital. The installation of this plant may be said to mark the successful conclusion of the government's undertaking at Alfred, which was to demonstrate the commercial production of machine peat fuel to the point where private capital would step in, and follow up the results obtained.

It should be generally understood, however, that owing to the introduction of mechanical equipment in the new installation, a good deal of time and labor will be devoted during the first season's operations to the perfecting of the plant and experimental work. Notwithstanding this, the managers of the enterprise anticipate a considerable production of fuel in 1912, though of course, nothing approaching the full capacity of the plant.

We desire to express hearty appreciation of the cordial manner in which the Journal has been received by the press generally, of the kindly references made both to the Society and its Journal, and of the expressions of good will and hope for our future welfare. Following are a few extracts from the Canadian press:—

The Society is doing good work, and should have the hearty support of the federal and provincial governments. Depending on a foreign country for a fuel supply which could be cut off at any time is a bad position for any country to be in. The development of the peat bogs will mean much in relieving the situation.

PETERBORO EXAMINER, January 9.

Vol. 1, No. 1 of the Journal of the Canadian Peat Society has been issued and makes a favorable impression.

WINDSOR RECORD, January 11.

The Warder is in receipt of a copy of the Journal of the Canadian Peat Society, and in kindly acknowledging the same, we offer our very best wishes for its future success. In its columns will be found reliable information as to the standing of the peat industry in Canada. The use of peat as an article of fuel has been clearly demonstrated to have passed its initial stage, so its use and manufacture will not be dependent upon conjecture as to its heating and power producing properties. The style and well-written articles together with its reasonable rate of subscription should merit for the Journal a large and substantial list.

LINDSAY WATCHMAN-WARDER, January 8.

This work of redeeming the peat bogs is the finest kind of conservation of resources.

MONTREAL WITNESS January 18.

Under the presidency of Dr. Haanel, Director of Mines for the Dominion government, there has been started at Ottawa a Society, known as the Canadian Peat Society, having for its object the advancement of the peat industry in Canada. This is an important work for two national reasons. First, we are very much dependent for fuel on American sources; and, secondly, it would mean another and very profitable industry for Canada. . . In 1909, Canada imported coal from the United States to the amount of nearly 10,000,000 tons, valued at $26,831,859. The development of some of our extensive peat bogs will help to keep some of the money at home, and to furnish additional employment to Canadians in Canada. . . In their work of turning the barren wastes into profitable fields of labor, the Canadian Peat Society are doing a truly patriotic work.

PRINCE RUPERT NEWS, January 16.

COMMISSION OF CONSERVATION.

At the Third Annual Meeting of the Commission of Conservation held in Ottawa, in January, the Chairman, Hon. Clifford Sifton, introduced the subject of peat fuel. In the course of the memorandum which he had prepared he said:

"There is no possible source from which cheap fuel can be procured to take the place of what is now being used which, in any respect, compares with peat. Ontario has an enormous area of peat bogs. The trouble heretofore has been that, until a very short time ago, the method of treatment was not economically successful, and it does not appear to be realized that, at the present time, that difficulty has been overcome and that an economically successful method of treating peat is now in existence and has been practically demonstrated within a few miles of Ottawa within the last two years. So, it is now a fact that, economically and commercially, the immense peat bogs of the Province of Ontario are available for fuel if a very small amount of commercial enterprise is used in connection with the subject.

"I am bringing this matter before you especially because of its great economic importance and because of the fact that I think the movement requires a little support at our hands. It quite frequently happens that in important branches of work of this kind you get to the point of doing very valuable work when, for some reason or other, you are shut off. There is obviously some little movement being made at the present time to shut off the activity in the development of peat fuel, and I think this is a proper case for the Commission of Conservation to exert what little influence it may have, to declare its position on this question and to use its influence on the Government to induce them to carry on this important work."

Later in the same day a brief discussion ensued, and a resolution was adopted, as follows:—

MR. SIFTON.—You will remember that this morning I read a memorandum on the subject of peat. A new government is in power, and the Minister may not

have the opportunity to study the question, or get any information for a year. He is busy with other things, and, of course, he cannot have studied the question as we have. It would be well for us to express ourselves strongly on the subject.

SENATOR EDWARDS.—It is really practically determined that this peat can be produced, there need be no question about the value of it?

MR. SIFTON.—Not a bit in the world. They produce power for not more than two-thirds of what it costs when burning coal, rather less than that, and they have produced fuel for stoves and grates which is of excellent quality. I cannot imagine anything that will be a greater boon to the community in general than the development of this fuel, which seems to be on the point of successful development. Until four or five years ago it had never been economically produced in this country.

SENATOR EDWARDS.—What is the nature of the recommendation you wish for?

MR. SIFTON.—I think what we ought to do is to place on record our appreciation, from the standpoint of conservation, of what has been done, and I would say that we ought to suggest to the Government that any further investigations along the line that are recommended ought to be pushed forward, and that the money for them will be very well spent. If you approve of my view the Secretary will put the motion in proper form.

DR. JONES.—I have much pleasure in moving that the Commission take action on lines suggested by the Chairman. I would move, seconded by Senator Edwards,—

THAT the Commission of Conservation approves of the investigation that has been carried on by the Mines Branch of the Department of Mines in connection with the commercial use of peat, and suggests that further investigations and experiments be made with a view to making the proposition still more attractive to the people.

The Commission also places on record its appreciation of the work of investigation that has been done."

Not only will the attitude of the Commission of Conservation towards the peat industry be a source of gratification to the men who are working for the advancement of this branch of industry in Canada and elsewhere, but their active support will be of immense service in aiding its development along practical lines and on a sound basis.

DRYING PEAT BY ARTIFICIAL HEAT.

Millions of dollars have been wasted in Canada and other countries in efforts to dry peat artificially to say 15 to 20 per cent. moisture content. The seriousness of the problem involved appears from the following table extracted from Prof. Chas. A. Davis' new book, The Uses of Peat.

Weight of water evaporated from a ton of peat as its water content is lowered, by 10 per cent. stages, from 90 per cent. to 10 per cent.

Percentage of water in peat.	Total dry-peat content.	Water content.	Water evaporated for each 10 per cent. reduction.	Residue left for each 10 per cent. reduction.	Total amount of water evaporated.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
90	200	1,800·0	....	....	....
80	200	800.0	1,000·0	1,000·0	1,000·0
70	200	466·7	333·3	666·7	1,333·3
60	200	300·0	166·7	500·0	1,500·0
50	200	200·0	100·0	400·0	1,600·0
40	200	133·3	66·7	333·3	1,666·7
30	200	85·7	47·6	285·7	1,714·3
20	200	50·0	35·7	250·0	1,750·0
10	200	22·2	27·8	222·2	1,777·8

Thus, taking a ton of raw peat as it comes from the bog with 90 per cent. moisture, one thousand pounds of water must be evaporated to reduce it to 80 per cent. moisture content, and 1,600 lbs. to reduce it to 50 per cent. To lower the percentage of water from 90 per cent. to 80 per cent. requires evaporation of 1,000 lbs. of water, while the last 10 per cent. reduction from 30 per cent. to 20 per cent. to complete the fuel requires evaporation of only 35.7 lbs. of water.

At 20 per cent. moisture content, the original ton is reduced to 250 lbs. So that in order to produce one ton of marketable fuel containing 20 per cent. moisture, it is necessary to lift 8 tons of material from the bog, and evaporate 14,000 pounds of water.

For the latter purpose no means has yet been discovered to compare in cheapness and efficiency with the action of the sun and wind in the air-drying process.

As for the other, the next few years will likely see considerable advance in the mechanical handling of peat, thereby materially reducing the cost of the finished product.

Investigation of European Peat Gas Producer Plants.

On February 1st, a deputation from the Canadian Peat Society, accompanied by Mr. A. W. Greene and Mr. John McKinley as representatives of the Ottawa Board of Trade, waited on Hon. B. Nantel, Minister of Mines, to present a petition asking for an investigation by the Department's engineers of recent installations in Great Britain and Europe of plants for the production of power from peat gas, with recovery of by-products. The following is the text of the petition, which was largely signed by parties interested in peat in Canada.

We, the undersigned members of the Canadian Peat Society, and others interested in the utilization of the peat resources of Canada, respectfully submit that:—

1. The action of the Dominion Government in investigating the conditions of manufacture of peat fuel in Europe and demonstrating its production by methods there in commercial use has already led to valuable results, and is likely to prove of material assistance in the establishment of a Canadian Peat Fuel Industry.

2. One of the most promising fields for the utilization of peat, and one of the most important to Canada, is in the production of peat gas for power purposes, as successfully carried out on a large scale at Oldenberg, Germany, and several other points in Europe.

3. While operations at the government fuel-testing plant have resulted in much valuable information being acquired with regard to peat gas producer plants, before any larger installations can be commercially attempted with safety in Canada, much remains to be learned as to the actual working of large unit plants, which can only be ascertained through personal inspection by qualified persons of plants in actual operation.

We would, therefore, respectfully recommend that an engineer or engineers be sent by your Department to investigate and report on the leading peat gas power installations of Europe with a view to ascertaining the best system and plants for use in Canada.

The deputation was favorably received, and it is hoped that early action will be taken in accordance with the prayer of the petition.

PEAT AS A FERTILISER.

The following item from the St. Thomas Journal of February 23rd, 1912, will be of interest to peat men:—

"Peat from the Lake."

"Tobacco Growers Find it Excellent as Fertiliser."

BLENHEIM, February 20.—"The Lake Erie shore, south of Cedar Springs, has been a busy place during the good sleighing, which has now gone. Tobacco growers for miles around arrived there with their teams and sleighs to get peat for their 1912 tobacco beds.

This peat is got from under the lake a short distance from the shore. The ice is picked off, and the frozen ground underneath picked away, and there is a good depth of rich, black peats."

This use of peat is particularly interesting in view of the results said to have been recently obtained in Great Britain and Europe in the gasification of peat, and consequent production of power, with saving of by-products. It is stated that the value of the by-products thus obtained will alone more than pay all operating expenses, leaving the power produced practically free of cost. Whether this be true or not this line of development of the peat industry is certainly one of great promise.

The principal by-product resulting from the gasification of peat in such a plant is ammonium sulphate, which is a valuable fertiliser finding ready market in Great Britain and Europe at about $60 per ton. As most of the bogs thus far examined in Canada are rich in nitrogen, and a number of these are located in the vicinity of towns which could use to advantage the power produced from the peat gas, this development may prove of great practical importance to this country. While a market abroad could be found for the output of fertilisers for some time to come, there is a growing demand for these products in Canada, as shown by the reports of the Department of Trade and Commerce.

The following table shows the importations of fertilisers into Canada during the past four years:—

	Dutiable.	Free.	Total.
1908	$259,132	$110,034	$369,166
1909	341,102	131,573	474,675
1910	350,907	130,549	481,456
1911	399,597	146,560	546,157

According to the Canadian Statistical Year Book the imports in 1902 amounted to $84,996, and in 1903 to $112,256. The present large volume, and the rapid rate of expansion of this trade indicate that an important industry may before long be built up in supplying the local demand.

PEAT PRODUCTS.

"Your Commissioner is informed that considerable quantities of peat moss litter are imported into Bristol from Germany, and other Continental sources of supply. As the subject of peat production, in view of the extensive peat areas that are known to exist in Canada, is one that may become of value there, it may be of interest to know that there is a market here for this material, and at the present time a company is engaged at Ashcott, Somerset, in the manufacture of peat moss, litter, burning peat, peat soil and peat fire lighters, which your Commissioner is given to understand are sold here at a price that leaves a very good margin of profit. A small pamphlet issued by this company is forwarded with this report, and can be seen at the Department of Trade and Commerce at Ottawa by any person interested in the subject."

Extract from report of E. D. Arnaud, Canadian Trade Commissioner at Bristol, England, December 20, 1911.

The prices quoted by the firm mentioned for their various products, as furnished by the Canadian Trade Commissioner at Bristol are as follows:—

Moss Litter, 22 shillings per ton, Peat Fuel, 16 shillings per ton, Peat Dust, 25 shillings per ton, Peat Soil, 12 shillings per ton, Peat Fire Lighters 12 shillings per crate of 30 six-penny packets, all F.O.B. at Ashcott.

The peat is cut by hand and air-dried. It is stated that one ton of Moss Litter is equal to about 2½ tons of straw, and after use as bedding makes 7 tons of manure.

Peat Moss Dust is ground finer than the litter, and is used in poultry houses, earth closets, and cess-pits, and is in good demand for sewage farms and sewage works, on account of its absorbent and deodorizing qualities. It is also used in many branches of horticulture by leading nurserymen and market gardeners. Peat Moss Dust is of special value for preserving ice, being a non-conductor. It is also used in the preparation of foods for fattening cattle, as it readily absorbs and retains all the ingredients necessary to a good rich food, and at the same time does not become sticky or difficult to handle.

Peat Fire Lighters are made from solid blocks of peat, sawn to the required size (about 2½ inches long by 1 inch square) and saturated with pitch. They do not crumble, are impervious to damp, and will not soil the hands. They are packed in boxes of 48 for six pence.

It should be profitable for manufacturers of peat fuel in this country to investigate the possibilities of some of these side lines or by-products of the peat industry, since to make the business a commercial success, the lighter surface peat, which is of comparatively small value for fuel purposes should be turned to the best account possible.—Ed.

ONTARIO PEAT BOGS, SYNOPSIS OF 1909 AND 1910 INVESTIGATIONS.

During the seasons of 1909 and 1910, ten bogs in the Province of Ontario were examined by the Mines Branch of the Department of Mines. For the sake of convenience, we present, in tabular form some of the results of these investigations. For comparative analyses shewing quality of peat, and other more detailed information, Bulletins 1 and 4 of the Mines Branch should be consulted.

BOG.	Approx. Areas (acre.)	Less than 5 ft. deep (acres.)	5 to 10 feet deep (acres.)	10 to 15 feet deep (acres.)	Over 15 feet deep (acres.)	Contents (cub. yds.)	Est. workable volume (cub. yds.)	Est. fuel production with 25 % moisture. (tons.)	Location and Shipping Facilities.
*Mer Bleue	5004	1564	2237	856	347	56,050,711	38,442,494	5,125,655	Eight miles from Ottawa, on C. P. R. and G. T. R. lines.
*Alfred	6800	1377	3084	1316	1014	100,182,456	70,270,200	9,369,000	Forty-four miles from Ottawa, on C. P. R. line to Montreal.
*Welland	4900	1423	2877	588	....	50,975,000	30,796,480	4,106,000	Six miles from Welland, Ont, on Welland Canal.
*Newington	3800	929	1191	748	974	62,913,813	46,566,478	6,208,800	Forty miles from Ottawa, on N. Y. & O. Ry.
*Perth	3800	678	958	2098	106	55,522,984	38,445,222	5,126,000	One and one-half miles from Perth, Ont.
*Victoria Road	67	36	15	12	4	638,709	402,441	53,000	One mile from Victoria Road, Midland Div. G. T. R.
†Brunner	2288	1260	1028	....	....	15,687,545	8,790,979	1,098,872	Eight miles from Stratford, Ont.
†Komoka	900	605	295	....	....	4,786,667	1,903,733	237,966	Two miles from London, Ont., on C. P. R. and G. T. R.
†Brockville	1400	356	475	490	79	18,601,464	12,705,969	1,525,749	Three miles from Brockville, Ont., on C.P.R.
†Rondeau	1571	959	316	207	89	13,985,477	7,856,581	982,072	Six miles from Blenheim, on Lake Erie.
	30,530					379,344,826	256,180,577	33,833,114	

*For further particulars see Bulletin No. 1, Department of Mines, 1909.
†For further particulars see Bulletin No. 4. Department of Mines, 1910.

PATENTS RELATING TO PEAT ISSUED BY THE CANADIAN PATENT OFFICE IN 1910 AND 1911.

	Number.	Date
		1910.
Peat cutting machine—Moulton to N. E. Fuel Co	123,131	Jan. 11
Cable traction system for travelling peat press—N. Fredriksson	123,877	Feb. 15
Plant for digging and working peat—N. Fredriksson	123,878	Feb. 15
Press for extracting water, liquids or juices from peat, etc., N. M. Rous	123,924	Feb. 15
Drying apparatus for peat and the like—Matheson to Farmer	124,384	Mar. 15
Peat fuel manufacturing machine—F. X. Frank	124,851	Apr. 5
Peat, marl, clay, lime, etc., drier—D. Diver	125,742	May 17
Process of manufacturing fodder composed of peat and molasses—E. Joseph	125,908	May 24
Peat preparing process—W. H. Bradley	126,206	June 7
Peat dredging engine with dredging cutters working in the travelling direction—W. Wielandt	126,536	June 21
Means for producing electric currents from peat—J. D. Oligny	126,650	June 28
Treatment of substances and peat to be dried by pressing—T. Franke	126,748	July 5
Elevator for extracting peat from peat bogs—A. Anrep	129,958	Dec 20
		1911
Peat conveyors, automatic rope arrangements for transporting carriages rolling on a shifting circular track—A. Anrep	130,479	Jan. 17
Peat digger—T. G. Amsden	131,446	Mar. 7
Peat drier—T. G. Amsden	131,447	Mar. 7
Plant for manufacture of peat briquettes—T. Franke	131,478	Mar. 7
Process of manufacturing peat briquettes—T. Franke	131,637	Mar. 14
Peat spreading and cutting machine—L. Krupp & Peat Industries Ltd	134,138	Mar. 21
Manufacture of moulded articles from peat—Pearson & Stoneham	135,511	Sept. 12
Peat plant—L. B. Lincoln	135,818	Sept. 26

NEW MEMBERS.

It should be the aim of every member of the Canadian Peat Society to aid in extending the influence of our Society and increasing the usefulness of its publications by securing as many new members as possible. There are thousands of people interested in agriculture, in fuel supply, in power and power production, and in chemical and technical work, to whom the development of the peat resources of Canada is of interest. We would, therefore, urge one and all to lend their assistance by sending in applications of such parties for membership in the Society, and by communicating to the Secretary addresses of others likely to be interested. A number of copies of the first issue of the Journal are still available to supply new members who may wish to possess a complete file.

New Members added to the Society since the issue of the last number of the Journal.

Beck, Hon. Adam—London, Ont.
Beswick, Wilfrid, Esq.,—Stockton-on-Tees, England.
Bickerdike, Robert, M.P.—Montreal, Que.
Binet, Rev. J. L., B.A., Ph.D.—University of Ottawa, Ottawa, Ont.
Briggs, O. P.—Minneapolis, Minn.
Carter, W. E. H., B.A. Sc., M.E.—Toronto, Ont.
Craig, J. M.—New York, N. Y.
Davis, W. A. Pollock—Philadelphia, Pa.
Day, W. H., B.A.,—Agricultural College, Guelph, Ont.
Deslongchamps, L. P., Manager "Le Devoir", Montreal, Que.
Erbes, L. C.—St. Paul, Minn.
Fisher, T. J.—Montreal, Que.
Fleming, Sir Sandford, K.C.M.G.—Ottawa, Ont.
Foersterling, Dr. H.—Perth Amboy, N. J.
Fuel Engineering Company—New York, N. Y.
Garrison, J. H.—Los Angeles, Cal.
German Kali Works—New York, N. Y.
Gregory, James S.—St. John, N.B.
Guttman, Dr. Leo. F.—School of Mining, Kingston, Ont.
James, C. C.—Deputy Minister of Agriculture, Toronto, Ont.
Library of Parliament—Ottawa, Ont.
Lindquist, E.—Royal Swedish Consul, Montreal, Que.
McBride, Hon. Richard—Victoria, B.C.
McGill College Library—Montreal, Que.
McKenna, Dr. Chas. F.—New York, N. Y.
Mills, A. L.—Mexico City, Mex.
Northwestern Drainage Company—Grand Rapids, Wis.
Pennsylvania State Library—Harrisburg, Pa.
Philipp, Herbert—Perth Amboy, N.J.
Pope, Allan, M. E.—Buffalo, N.Y.
Ranson, Robert—St. Augustine, Fla.
Ross, Hon. W. R.—Minister of Lands, Victoria, B.C.

Sawyer, D. Smiley—Ottawa, Ont.
Smith, Frank Morse—New York, N. Y.
Snowball, W. B.—Chatham, N.B.
Sothman, P. W., Chief Eng. Hydro-Electric Commission,—Toronto, Ont.
Staff, Charles—Detroit, Mich.
Stewart, John T.—St. Paul, Minn.
Sudor, Anthony—St. Paul, Minn.
Walker, Stratman & Company—Pittsburg, Pa.
White, James, Secretary, Commission of Conservation—Ottawa, Ont.
Wood, J. P.—Chathem, N.B.

o.

Double Number

Vol. 1 MAY and AUGUST, 1912 Nos. 3 & 4

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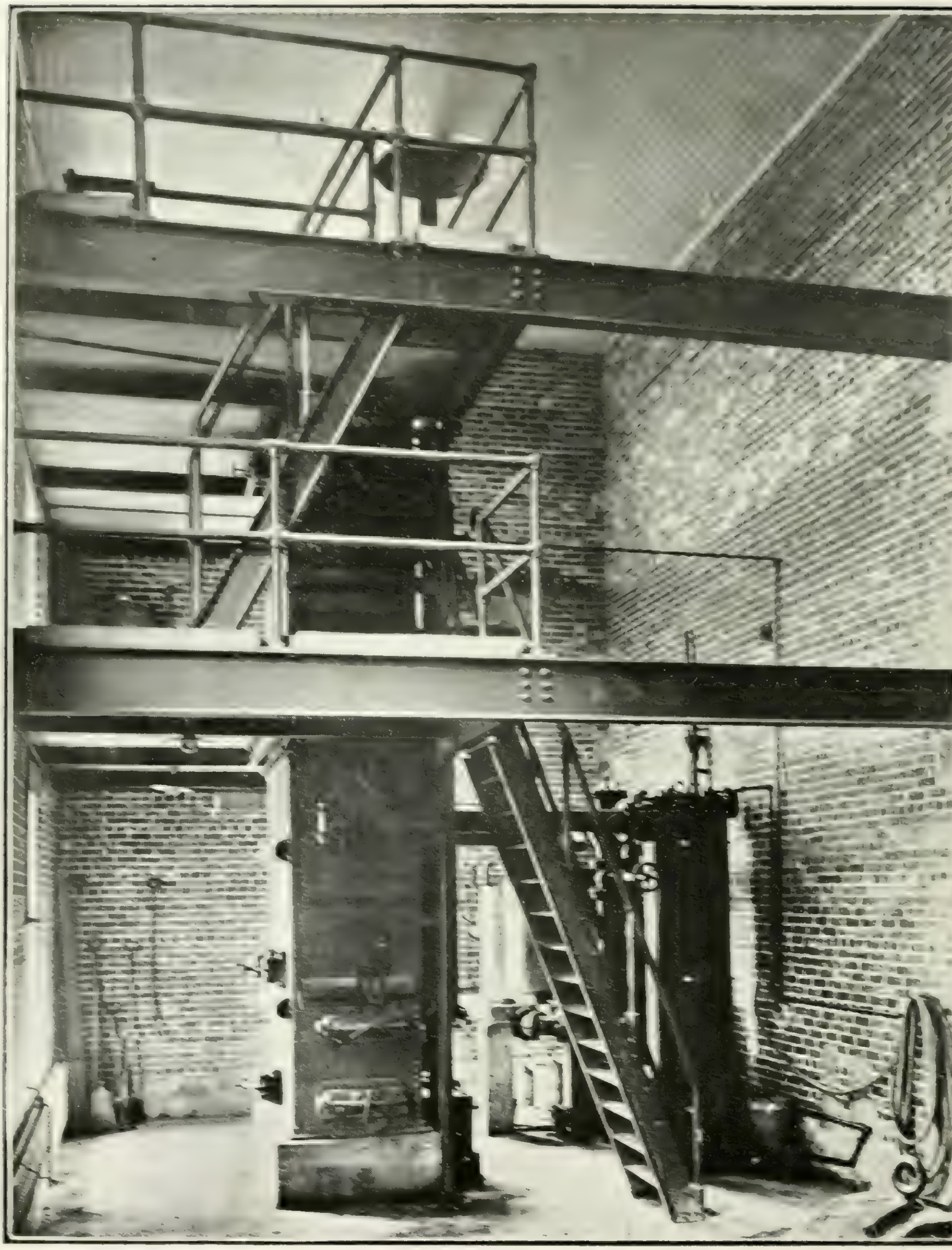


GENERAL VIEW OF PEAT GAS PRODUCER

Journal of the
Canadian Peat Society

Vol. 1 MAY and AUGUST, 1912 Nos. 3 & 4

ABSTRACT OF

REPORT ON THE UTILIZATION OF PEAT FUEL FOR THE PRODUCTION OF POWER: AN ECONOMIC INVESTIGATION.

By B. F. HAANEL, B.Sc.

With a view to ensuring an orderly arrangement of the resultant record of the experiments conducted with peat fuel, for the production of power through the medium of the gas producer, the report is divided into two parts:—

I. Description of the Korting producer gas plant, and cleaning system —as originally constructed and installed at the Fuel Testing Station, Ottawa; together with complete detailed records of the trials and tests conducted therewith;

II. Description of the alterations made to the producer plant by the makers; added to which are complete detailed records of the trials and tests conducted after the alterations had been made.

PART I.

INTRODUCTION.

The numerous requests received at the Mines Branch for information concerning the economic utilization of peat in a producer-gas power plant, led to the preparation of the present report. The primary object in establishing a Fuel Testing Station at Ottawa was, to demonstrate that peat could be economically utilized as a fuel for power purposes in a producer-gas power plant. Since then, it has been decided to extend the scope of the investigations, namely, to include the testing—on a commercial scale and in a commercial

(Report on the Utilization of Peat Fuel for the Production of Power. Being a record of experiments conducted at the Fuel Testing Station, Ottawa, 1910, 1911. By B. F. Haanel, B.Sc., Chief of Fuel Testing Division, Mines Branch, Department of Mines, Ottawa, Canada. Government Printing Bureau, 1912.)

gas producer—of the bituminous coals of the extreme eastern and western provinces, and of the lignites of Manitoba, Alberta, and Saskatchewan.

The producer-gas plant was installed at the Fuel Testing Station for testing the various kinds of fuels met with in Canada, in order to show, principally, the great saving in fuel which could be effected by its use. Some years ago it was scarcely safe for an engineer to recommend a producer-gas power plant as a substitute for steam power, on account of the unreliability of the former; but, to-day, the improvements, both in the design and method of operation—the result of many years of experimentation—have rendered this type of power plant thoroughly reliable. The ordinary steam power plant—ranging in capacity from 50 to 200 horse-power—consumes about 7 lbs. of coal per brake horse-power hour; assuming the coal to have a heating value of 12,500 British thermal units per lb. This statement, it must be understood, only relates to average small steam power installations. In larger and more elaborately designed steam power plants, as, for example, the power plant of the Interborough Rapid Transit Company, of New York, the consumption of fuel of the same heating value is in the neighbourhood of only 2 lbs. This fuel consumption—of probably the most economical steam power plant on the continent—affords a notable contrast to the fuel economy of a modern producer-gas power plant, viz., 1¼ to 1½ lbs. of coal, of the above heating value per B.H.P. hour. Although far better economy than the above has been recorded for producer-gas power plants, the writer has chosen to use a conservative figure, which can be easily attained without the assistance of expert producer operators. This fuel economy, moreover, is realized with the small producer-gas plant as well as with the large; while the maximum efficiency of the steam plant is generally only attained with the largest and most elaborate installations. Cases can, of course, be cited of certain small steam plants, where the fuel economy—for a steam plant—is remarkable. This, however, does not affect the above figure, of 7 lbs. of fuel per brake horse-power hour, which the writer believes is a fair average fuel consumption for the ordinary steam plants of from 50 to 200 horse-power capacity, met with throughout the country.

The absence of smoke and smoke-stack; simplicity of operation and design—especially in the smaller suction producer-gas power plants—and safety in operation, are a few advantages, apart from the great saving in fuel, which would recommend such a plant to power producers.

The great saving in fuel effected by the use of producer-gas power machinery will be most apparent in those places which are removed some distance from coal mines, and especially in the western provinces possessing lignite deposits.

The above remarks apply especially to the central provinces, in which

large areas are covered by peat bogs, but which possess no coal or known lignite deposits of economic value. In these provinces, where all the coal used for industrial purposes is imported from some foreign source, the necessity for reducing the amount needlessly used is most urgent. Moreover, since the producer-gas power plant can efficiently utilize some of the cheapest and lowest grades of coal which are not suitable for steaming purposes, the saving in fuel bills, resulting from the use of these low-grade fuels, will be apparent to most power producers.

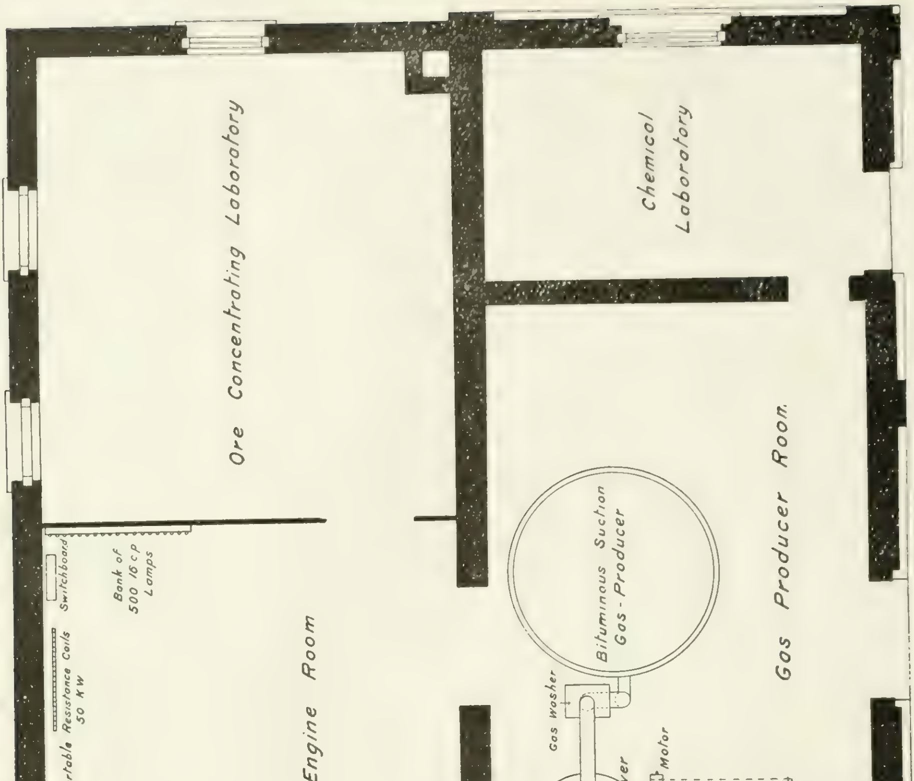
Before deciding upon the types of producers desirable to install at the Fuel Testing Station, a careful study of the question was made both in European countries and in the United States, and as a result, two producers, which were shown to be commercially successful, were purchased.

The slow development, in Canada, of this class of power plant, is partly due to lack of reliable information concerning the gas producer and gas engine, generally, and the type or design suitable for the special fuel it is desired to utilize—and particularly to the failure of some plants which were guaranteed to satisfactorily operate with fuels for which they were supposedly designed. While instances of this kind are not common, yet, a few failures are sufficient to cause manufacturers, power producers, and others, to lose confidence in everything pertaining to such a system.

By publishing the results of the investigation of the various fuels tested in the producers at the Fuel Testing Station, it is hoped that those power users who have been unfortunate in their selection of a gas producer and engine, and hence have lost confidence in the gas producer and gas engine as a reliable and economic method of producing power, will have their confidence restored, and their interest reawakened to the great possibilities of the producer-gas power plant as a means of producing cheaper energy than can now be obtained with the steam power plant.

Since this report may be read by many business men who are interested in the development of peat bogs as a source of fuel for the production of power, and who may not be possessed of the same degree of knowledge concerning the producer-gas power plant as they possess of steam power plants, especial care has been taken to describe, as minutely as possible, the apparatus entering into such a plant.

The erroneous notions which the writer has often heard expressed concerning the gas-engine have led to a more detailed description being given of both the theoretical principles governing its operation and the respective parts of which it is constructed, than is usual in government technical publications. With this practical object in view, illustrated descriptions of the gas-producer and gas-engine, and their auxiliary apparatus, have been inserted in the text —wherever deemed necessary.



GROUND FLOOR PLAN OF FUEL TESTING STATION

GENERAL EQUIPMENT OF PLANT, AND ARRANGEMENT OF MACHINERY.

The Fuel Testing Station is equipped, at present, with a 60 H.P., double zone, Korting peat gas producer, with wet coke scrubber, tar filter, and dry scrubber; and a Westinghouse 100 H.P. bituminous, suction gas producer, complete, with exhauster, wet scrubber, gas receiver, and moisture separator, and a 60 H.P., 4 stroke cycle, single acting Korting gas engine. A small exhauster, driven by a 1 H.P. electric motor, is installed for starting the peat gas producer, and an air tank, with compressor driven by a 3 H.P. motor, supplies air under a pressure of nine atmospheres for starting the engine. A 50 K.W. direct current Westinghouse electric generator is directly connected to the engine.

For the purpose of absorbing the electrical energy generated when making a test, a 50 K.W. portable resistance, and a bank of 500 16 c.p., incandescent lamps are provided.

The electric generator is connected to a switchboard provided with a Weston ampere-meter and volt-meter, from which leads are taken to the resistance rack, to a 40 H.P. motor used for driving the concentrating machinery located in the same building, to the peat crushing motor, and to the lighting circuit.

A small crusher driven by a direct current motor is placed in the peat shed; where the peat blocks, as they arrive from the bog, are crushed to the size most suitable for the producer.

The chemical laboratory is located at one end of the producer floor, and is provided with the necessary apparatus for making complete gas analyses, fuel analyses, and determinations of the calorific value of fuels.

The calorific value of the producer gas is determined by means of a Junker's continuous calorimeter, which is placed in the engine room, close to the gas main. This calorimeter is provided with a small exhauster, driven by a 1-10 H.P. motor, which delivers gas at constant pressure to the calorimeter. The general arrangement of the machinery, testing apparatus, and chemical laboratory, is clearly shown on Fig. 1, and hence requires no further explanation.

PEAT GAS PRODUCER. (page 7)

Description.

The producer shown in Plate II consists of a rectangular steel shell, having the following outside dimensions: 2′-9″ x 5′-2″, in horizontal section, and 15′-0″ high, from floor level to top of charging hoppers. For cleaning

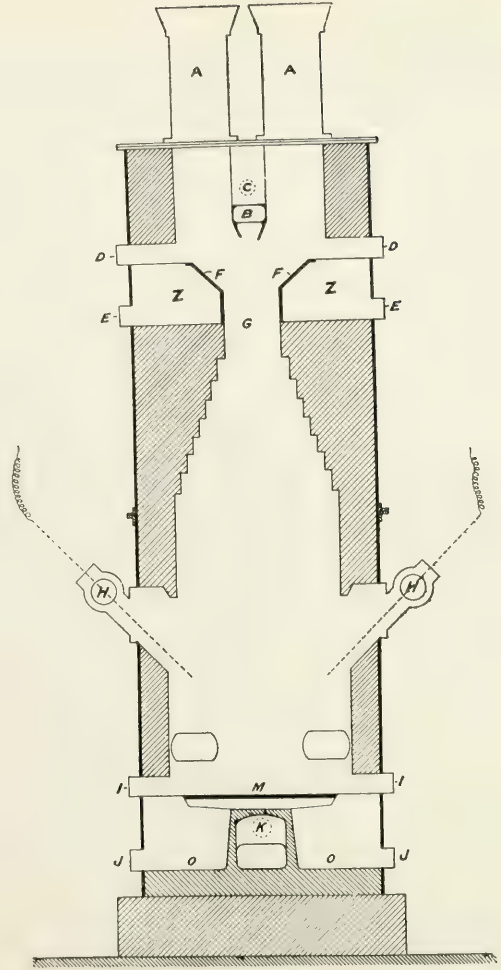


Fig. 2.—Sectional Elevation Through A-A

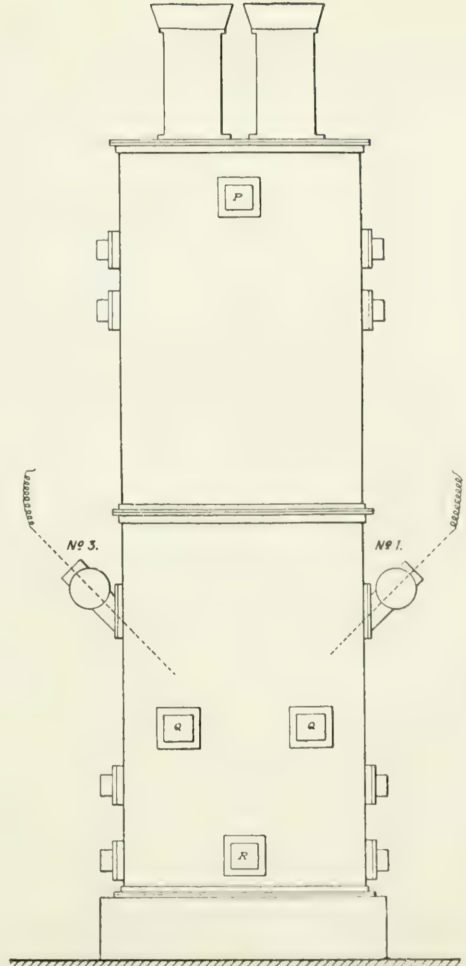


Fig. 3.—Rear Elevation

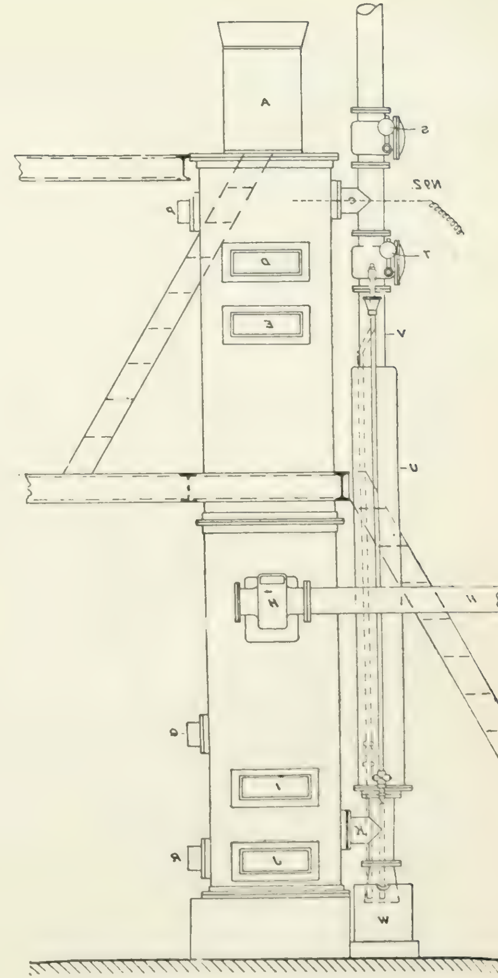


Fig. 4.—Side Elevation

KORTING PEAT GAS PRODUCER (BEFORE ALTERATION)

fires and removing ashes, 12 doors are provided: four on each side, and four on the back. These doors are shown on Plate II.

On Figs. 2, 3, and 4, the producer is shown in section, rear elevation, and side elevation, respectively.

It can be seen by Fig 2, that the producer consists of two combustion zones: **F-F** at the top and **M** at the bottom. **F-F** represents inclined grate bars: **D-D** doors for poking and cleaning the fires resting on the grates **F-F**. The ashes resulting from the combustion of the fuel on these grates drop into the chambers **Z-Z**, and are removed through the doors **E-E**. The gases evolved at this zone are drawn off through the chamber **B**. The dust and tar which are caught in this chamber are removed through door **P** on the back of the producer, as shown in Fig. 3. **A-A** represents charging hoppers.

M, on Fig. 2, represents the grate bars of the lower zone, and **I-I** the doors through which the fires of the lower zone are poked and cleaned. The fire above the grates of the lower zone is poked through the doors **Q-Q**, as shown in Figs. 3 and 4. The ashes resulting from the complete combustion of the fuel in this zone fall through the grate bars into the chambers **O-O**, and are removed through the doors **J-J**.

The products of the combustion taking place in the upper zone are drawn off through chamber **B**, through the pipe **C**, and vertical pipe **V**, shown in Fig. 4, to chamber **K**, Fig. 2; when they pass finally through the fuel of the lower zone to the two gas off-takes, **H-H** Fig 2.

S, on Fig. 4, at the top of vertical pipe **V**, is a damper which is opened to allow the gases resulting from the combustion of the peat to pass into the atmosphere—when the producer is standing idle. The damper **T**, also on Fig. 4, is closed while the producer is standing idle; but it is opened and the damper **S** closed when the producer is in operation. These two dampers are provided with cover plates, which can be readily removed when it is necessary to remove from the damper chambers any material which has collected therein. The vertical gas pipe **V**, is cooled by means of cold water continually circulating in the jacket **U**. The cooling water enters at the bottom of this jacket, and overflows at the top. **W**, is a water seal, which covers the open bottom of the vertical pipe **V**.

The ashes which fall through the grate bars **M** into the gas chamber **K**—shown in section in Fig. 2—are removed through door **R**, shown in Figs. 3 and 4.

The off-takes, **H-H**, shown in Fig. 2, are provided with caps held firmly in place by clamps; which may be removed for the purpose of inspecting the interior of the producer, at this point, or, for the purpose of removing any dust or tarry matter which may collect in the gas chambers.

Referring to Fig. 1—which shows a plan of the producer, gas piping and

cleaning systems—the two ends of the pipes connecting the producer to the cleaning system are provided with caps 1, 2, 3, and 4, respectively, which can be easily removed, when necessary, for the purpose of clearing them of any matter which may adhere to the walls of these pipes.

For the purpose of regulating the amount of air entering the producer at the top and bottom zones, two adjustable air-openings not shown in the figures—are provided on each of the doors **E-E** and **J.J.**

Cleaning System.

In order that a sufficiently cooled gas, free from tar and dust, may be delivered to the engine, the gas, after leaving the producer, passes through a cleaning system which is composed of a wet coke scrubber **D.** (Fig. 1), tar filter, and dry saw-dust scrubber **F.**

The general arrangement, and means of operating the cleaning system, will be readily understood by referring to Fig. 5: which represents an ideal section of the producer-cleaning system and engine. The producer shown in section in this figure is not of the same design as the one installed at the Fuel Testing Plant at Ottawa; but the general arrangement, and construction of the cleaning system, are practically the same as that illustrated in Fig. 5.

The gas, after leaving the producer, enters the wet coke scrubber **A**, Fig. 5, at the bottom, and passes upward through about 3 feet of closely packed coke, which is continuously sprayed with water by the sprays marked **E-E-E.** In this scrubber, the hottest gases come into contact with the warmest water at the bottom; finally passing off at the top through the coldest spray. In this manner, the greatest cooling effect with a given amount of water is obtained. In passing through the wet coke, the gas not only loses the greater part of its sensible heat, but is freed from dust, and some of the tarry matter which was carried in suspension in the gas.

From the wet coke scrubber just described, the gas passes through a tar filter placed at **C**, but not shown in this figure. This filter is composed of a number of staggered baffle plates, around which the gases pass before passing finally through four perforated metal plates. The baffle plates and perforated plates are washed by sprays of hot water. The hot water for spraying the tar filter is obtained from the return cooling water of the gas engine. This filter removes the larger portion of the tarry matter carried over from the coke scrubber. After leaving the tar filter, the gas finally passes through the dry scrubber **B.** This scrubber is filled with excelsior at the Fuel Testing Station instead of with saw-dust which is used in some plants. The "excelsior" (wood fibre) absorbs most of the moisture and some of the tarry matter which is carried in a very finely divided state past the tar filter. Before entering the engine, the gas passes through a gas receiver; where the moisture

still contained in the gas, after passing through the dry scrubber, is deposited. The water collected in this gas receiver is pumped out from time to time—preferably at the end of a week's run.

The wet coke scrubber contains about 500 lbs. of coke. This coke should be taken out and washed about once every two or three months. The excelsior in the dry scrubber should be renewed every two or three months. The condition of this excelsior can be readily ascertained at any time, when the plant is not in operation; simply by removing the cover of the dry scrubber and inspecting the contents. The frequency with which the cleaning materials require to be treated or renewed, varies with the cleanliness of the gas. If the gas passed through the system contains much tarry matter, which is not separated out before reaching the dry scrubber, the excelsior in the scrubber will soon become clogged, and cease to fulfil its function of absorbing moisture and further cleaning the gas; and will, moreover, offer a considerable resistance to the passage of the gas. The resistance met with by the gas in the different parts of the cleaning system is shown by means of suitably placed water gauges.

Principle of Operation of the Korting Peat Gas Producer.

When the producer is in the proper condition for operation, that portion between the lower grate bars **M** and the grates **F-F** (Fig. 2) of the upper zone is completely filled with peat coke: peat free from moisture and volatile matter. That portion of the producer between the upper grate level and tops of hoppers **A-A** is filled with raw peat: peat as it comes from the shed. The function of the upper zone consists in driving the moisture and volatile matter from the peat which supplies the lower zone. To prevent, as far as possible, the products of combustion in the upper zone from being drawn by the suction of the exhauster or gas engine, straight down through the producer and out through the off-takes **H-H** instead of being drawn out through **C** and then having to pass up through the incandescent fuel in the lower zone before reaching **H**, the construction of the firebrick lining is made as shown in Fig 2: a contracted neck, **G**, being made just below the upper zone. When the producer is entirely filled with peat coke to the upper zone grate level, the resistance offered to the passage of the gases evolved in this zone through the contracted neck **G** is greater than that offered to the passage of the gases through chamber **B** and pipe **C** (Fig. 2), down through pipe **V** (Fig. 4) and chamber **K** to the lower zone; and then up through the incandescent carbon to the off-takes **H-H**. This double zone construction makes it possible to feed tar, and moisture-free fuel, to the lower zone, where the bulk of the final gas is formed.

The combustion taking place at the upper zone is just sufficient to supply

the heat necessary to evaporate the moisture and drive off the volatile matter contained in the peat fed into the hoppers **A-A.**

The gaseous products, viz., water vapour, tarry vapours, carbon monoxide, carbon dioxide, and a small percentage of gaseous hydrocarbons, in the form of stable gases, resulting from the combustion taking place in the upper zone, are drawn off, as explained previously, through the chamber **B** (Fig. 2) and down through the water-cooled pipe **V** (Fig. 4) to the gas chamber **K**, located under the fires of the lower zone. Some of the moisture and tarry vapours are condensed on the water-cooled surface of pipe **V**, and drop to the bottom of the water seal **W** (Fig. 4), from which the tar can be readily removed. That portion of the water and tarry vapours which escapes condensation in passing down through the water-cooled pipe **V** is drawn up through the incandescent peat coke of the lower zone, and through the gas off-takes.

A part of the moisture which escapes condensation in the water-cooled pipe **V** is decomposed by reaction with the hot carbon, forming free hydrogen, carbon-monoxide, and carbon dioxide. Part of the carbon dioxide is reduced to carbon monoxide, and some of the tarry vapours are changed to stable gaseous, hydrocarbon compounds. The following analysis shows the composition of a sample taken from the gases evolved in the upper zone:—

CO_2	15·3 per cent. by volume.		
CO	7·2	"	"
O_2	3·2	"	"
C_2H_4	0·7	"	"

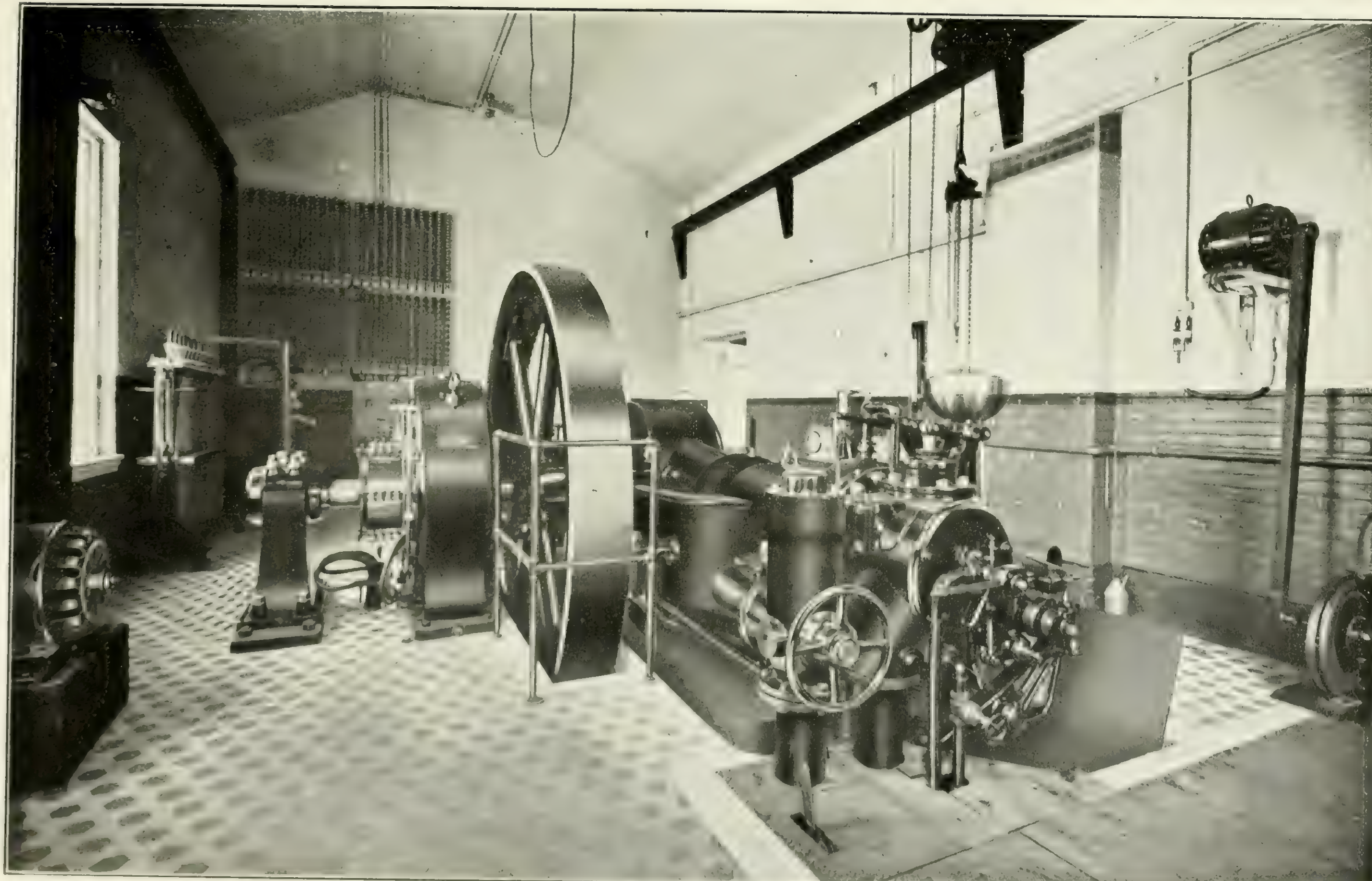
the residue being chiefly nitrogen. The gases also contain water and hydrocarbon vapours, which condense in the sample bottle before analysis.

In order to ensure the best operation of this producer, care must be exercised to ascertain the most suitable size to which the peat fed into the hoppers should be crushed; since the peat in passing through the producer, remains only a comparatively short time in the upper combustion zone; and the process of coking must be completed in this interval. If the peat is too wet or is not crushed small enough, the peat passing through the contracted neck **G** to the lower zone will be only partially coked, and in some cases only the moisture will be evaporated. The greater the moisture content the smaller should be the pieces of peat fed into the producer.

When peat only partially coked finds its way into the lower combustion zone, it is impossible to obtain a gas sufficiently free from tar for use in the gas engine.

Utilization of the Heat of the Exhaust Gases. (page 25)

It was previously mentioned that only 30 per cent of the heating value of the gas delivered to the engine was converted into useful work in the



GENERAL VIEW OF KÖRTING GAS ENGINE, AND INTERIOR OF ENGINE ROOM

cylinder; the other 70 per cent. passing off in the exhaust gases and cylinder jacket cooling water. This latter amount of heat is approximately equal to 6,000 B. T. units, or half a pound of coal containing 12,000 B. T. units per pound, per B. H. P. hour. This heat loss is so considerable that, many attempts have been made by experimenters to recover at least a part of it by utilizing the heat of the exhaust gases and cylinder cooling water for power or other purposes. If this heat could be even partially converted into useful work, the efficiency of the gas engine would be appreciably increased.

The possibility of utilizing the heat of the exhaust gas for steam raising in specially designed steam generators has been investigated, and results have been attained which demonstrate that such a utilization of the heat of the exhaust gases is practically feasible.

In connection with large gas engine installations, low pressure steam has been generated in this manner and utilized in low pressure steam turbines. The steam thus generated, or the water heated, might also be utilized for heating buildings or for drying purposes, etc.

If we assume, for example, that 3,000 to 3,600 B. T. U. per hour per B. H. P. developed by an engine is available, and can be utilized in the production of steam, an output not exceeding 2.2 lbs. of steam per hour, at a pressure of 70 to 85 lbs. per square inch per B. H. P. developed, could probably be obtained. But, in order to recover this waste heat, the engine must work at least at about two-thirds of its maximum power; if not, the exhaust gas is expanded down so much by the modern methods of governing that it is not hot enough to give up any appreciable quantity of heat for recovery in this manner.

By way of illustration, we will consider the case of a 100 B. H. P. gas engine working at full load. The amount of heat available per hour will be approximately 350,000 B. T. units; and since 3,500 B. T. units will generate 2.2 lbs. of steam at a pressure of 70 to 85 lbs. per square inch, the total amount of steam generated from the utilization of the 350,000 B. T. units will be 220 lbs. If this were utilized in a non-condensing steam engine, the power developed would be about 6 H. P., or 6 per cent. of the power of the gas engine. This is not inconsiderable, and will become a very appreciable factor in large gas engine installations.

PART II. (page 63)

RESULTS OF TRIALS WITH PRODUCER: AS ALTERED BY THE KORTING BROTHERS, HANOVER, GERMANY.

Introduction.

The trials described in part I, demonstrated that, with the producer and cleaning system as originally designed and constructed, it was impossible to obtain a gas sufficiently free from tar to permit the engine to operate many hours without cleaning the cylinder and valves. It was also shown that the operation of cleaning could be performed while the engine was in motion, without in any way interfering with the load; but while the plant could be run for an indefinite period without having to shut down for purposes of cleaning, efforts were made to discover the seat of the trouble, and, if possible, to correct it.

The results of the many trials conducted by the writer and his technical staff, tended to point to a faulty construction of the producer itself; and on the strength of the deductions made from the observations, certain changes in the internal construction of the producer were recommended to Korting Brothers, Hanover, Germany—the manufacturers of the plant.

With a view to assisting them in their efforts to eliminate the tendency to the formation of tar in large quantities, the Mines Branch sent to their works at Hanover, Germany, ten tons of the peat manufactured at the Government peat plant at Alfred. After a lengthy investigation of the behaviour of this peat under varying conditions in a similar producer erected in their shops, they reported as having succeeded in obtaining a gas free from tar, and on which the engine could operate for many months without cleaning.

To accomplish this result, the engineer-in-charge—acting upon the results of our investigation—deemed it advisable to alter the shape of the lining of the producer; because the contracted neck described in the foregoing pages did not offer sufficient resistance to the passage of the gas down through this neck to the off-takes, hence, instead of operating as an up-draft producer, in the upper zone, it acted partially as down-draft.

In order to overcome this difficulty, the contracted neck was made much longer, thus increasing, considerably, the resistance to the passage of the gas through this channel.

The cleaning system was also altered, as will be described later.

But even with these alterations, the producer, though undoubtedly improved, failed to deliver a gas sufficiently free from tar to permit of more than a few hours' operation of the engine before it became necessary to clean the valves and cylinder to prevent sticking; and the old remedy of washing with oil-soap and water had to be resorted to.

The trials made by the producer expert sent by the Korting Brothers from Germany did not prove satisfactory, as regards the generation of a tar-free gas, consequently, a series of tests were conducted by the technical staff of the Fuel Testing Division for the purpose of ascertaining the cause of the trouble, and, if possible, discovering some means of correcting it.

During these trials the producer was operated under varying conditions, as regards air openings in the upper and lower zones: the objective being, to ascertain the particular air openings with which the producer delivered the cleanest gas, and, if possible, to balance the two zones. After many trials, the idea of appreciably decreasing the tendency to the formation of tar, by this means, was abandoned; since, even with a large range of air-openings, the composition of the gas was only slightly altered, and the quantity of tar carried past the cleaning system did not vary to any appreciable extent.

As a result of many trials made with the producer in its original and altered state, it was concluded that the tarry components of the gas evolved in the upper zone could not be entirely burned or split-up into permanent combustible gases; and for this reason, a special method of cleaning the gas was resorted to in order to overcome the difficulty.

After considerable experimentation, the writer succeeded in devising a cleaning system which effectively separated the troublesome tarry matter from the gas; so that irrespective of the behaviour of the producer itself, namely, whether it operated as down-draft or up-draft, with large or small air-openings, the gas at all times was sufficiently clean to offer no obstruction to the normal operation of the gas engine.

While, under the original construction, it was necessary to remove and clean the mixing or admission valves after a few hours' run—and even the piston, after a few days—it is now possible—under the new conditions—to run for many days before it becomes necessary to clean either the mixing or admission valves, and the piston should not require cleaning more than once or twice a year, if the plant is operated continuously. This system of cleaning will be described later.

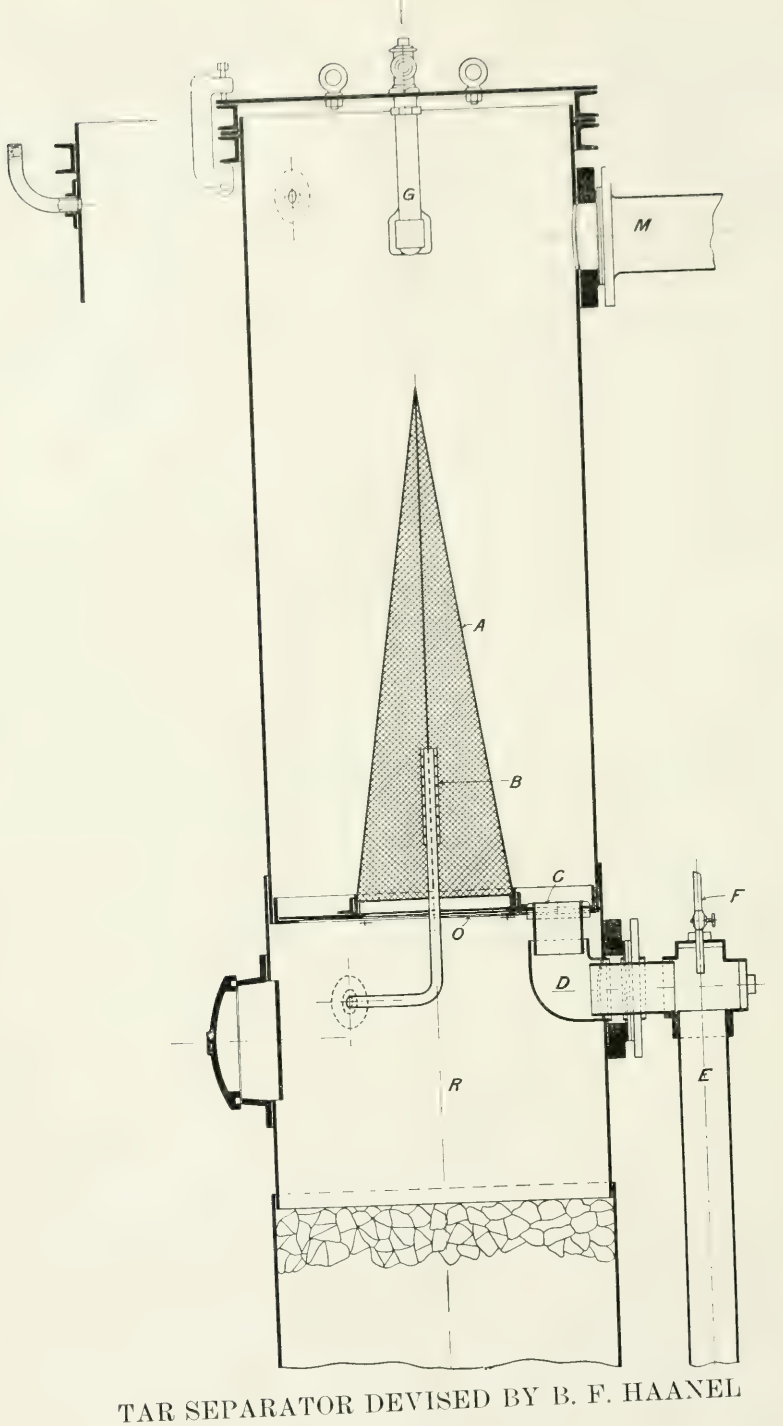
(Alterations to be seen from drawings.)

DESCRIPTION OF TAR SEPARATOR DEVISED BY B. F. HAANEL.

(page 69)

The system invented by the writer, for the separation of tar and tar fog from producer gas, is shown in sectional elevation, Fig. 13.

The lower part of the coke scrubber has not been altered. The cylinder, **K-K**, Fig 12, and perforated plate **J**, have been removed, and in their place has been substituted the wire mesh cone, **A**, Fig. 13. At **C**, an overflow has been provided for the purpose of carrying away the solid matter separated from the gas on the outside of the cone and washed off by the spray **G**.



TAR SEPARATOR DEVISED BY B. F. HAANEL

A water spray, **B**, serves the combined function of washing the interior surface of the cone and cooling the gas. At **F**, a water jet has been provided for sluicing the overflow pipe **E**, whenever this shows a tendency to clog. This, however, it has never been necessary to use, the overflow pipe remaining absolutely clean.

The water spray, **G**, which in the old system was supplied with cold water only, is now connected by a two-way cock to the return cooling water from the gas engine. Whenever the suction in the chamber containing the wire mesh cone begins to rise, the cold water at **G** is shut off and the hot water turned on. By this means the suction, whatever it may be, is brought to normal in about a minute. The cone is made of 40 mesh brass wire screen.

DESCRIPTION OF OPERATION.

The gas passes through the wet coke into chamber **R** as before. From this chamber the expanded and cooled gas is drawn through the opening **O**, through the cone screen, and passes out at **M**.

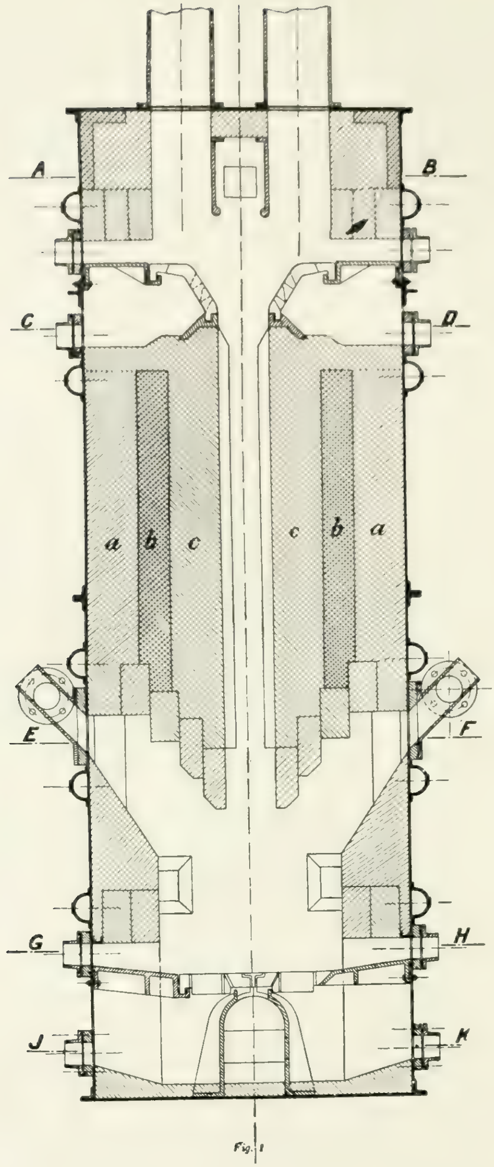
In passing through the cone screen, some of the particles of the tar-fog still carried by the gas, impinge against the metallic surface of the cone, aggregate into comparatively large drops, and are then washed off by the continuous spray **B**—dropping into chamber **R**, through the wet coke, down to the water seal. The particles escaping contact with the metallic surface of the cone, in passing through the fine meshes are crowded together, and are thus caused to coalesce, forming larger drops which either adhere to the outside surface of the cone or drop to the bottom, when the continuous cold water spray **G** washes this tarry matter to the overflow at **C**.

It will thus be seen that the action of the cone screen in eliminating the tar fog is twofold: (1) in producing coalesence of the fog particles by impact with the solid parts of the screen; (2) causing coalesence of the fog particles, by crowding together the stream lines as the gas passes through the fine meshes of the screen, and retarding the particles by friction with the internal surface of the meshes.

When the suction shows a tendency to increase, the cold water at **G** is turned off and the hot water turned on; which thoroughly cleanses the cone in a very short time, at an expenditure of a very small amount of water.

An automatic arrangement is being devised whereby an increase in suction will instantly turn off the cold, and put on the hot water, and *vice-versa*. By this device, the consumption of both hot and cold water can be reduced to a minimum.

In ordinary practice, however, it has not been found necessary to resort to the hot water spray more than two or three times during a ten hours' run. In order to maintain a straight and normal suction curve during the entire



SECTIONAL ELEVATION OF KORTING PEAT GAS PRODUCER
(AFTER ALTERATION)

period of operation, a simple automatic arrangement for changing from cold to hot water and *vice-versa* would be an advantage. But while this would prove an advantage, it is in no sense a necessity.

The water consumption for cleaning with this new system is not increased over that of the old: which was very small.

The gas, after leaving this cleaning system, is sufficiently free from deleterious material, so that it can be used in the gas engine without any trouble whatever. Moreover, the cleanliness of the gas is not dependent on the perfect operation of the producer itself, but permits of a large variation in the conditions governing its operation. For example, the cleanliness of the gas—its freedom from tarry matter, as it leaves the producer—depends (1) on the moisture content of the peat burned; (2) to some extent on its quality, and (3) quite considerably on the amount of air admitted to the two zones. Close and careful regulation is, therefore, not so essential to the cleanliness of the gas leaving the cleaning system as it was with the former construction, although obviously an advantage in so far as the waste of tarry matter is reduced.

GENERAL DEDUCTIONS AND CONCLUSIONS. (page 85)

The tests carried out and described in the foregoing pages are divided into two parts:—

Part I.

Part I describes the tests carried out with the producer as originally constructed. This series of tests showed a good fuel economy, but left something to be desired as regards the cleanliness of the gas delivered to the engine. The deposition of tar in the gas main, and on the valves, cylinder, and piston of the engine, necessitated the cleaning of the parts affected. At the close of the run it was generally found necessary to remove the valves for cleaning, and to wash the cylinder and piston from time to time during the running of the engine. The operation of cleaning was accomplished by syringing the cylinder and piston with a mixture of oil-soap and water; and while the continuity of the running of the engine was at no time endangered by the presence of tar, the operation of cleaning occupied more of the engineer's time than was considered desirable.

In order to obviate this trouble, such as it was, the makers at their own expense had the producer reconstructed.

Part II.

Part II of the report deals with the tests carried out with the producer as reconstructed by the makers, and with the modification introduced by the technical staff of the Fuel Testing Station.

Upon scrutinizing the first of this series of tests it will be perceived that tar still reached the engine in spite of the change in construction; and although a manifest improvement was discerned, it was found necessary from time to time to wash the cylinder and piston as in the previous series of tests.

Further tests were conducted in order to observe the effect which changes in the distribution of the air admitted to the upper and lower combustion zones would have upon the production of tar. The results of these tests led, on the one hand, to the abandonment of the idea of totally destroying all the tarry matter within the producer itself, and on the other hand, to the necessity of separating the tar from the gas in the cleaning system.

After some preliminary experimentation, a solution of the problem was found by placing a gauze cone in the top chamber of the coke scrubber. After the inclusion of this cone in the cleaning system no further trouble with tar was experienced, *and the operation of the plant, as it now stands, may be pronounced as entirely satisfactory.*

The results of the investigation may be summarized as follows:—

Reliability.

The peat producer-gas power plant, as now constructed, may be pronounced thoroughly reliable. Its operation may be carried on continuously for a week or more without having to shut down for the purpose of cleaning the valves of the engine. The engine has been operated for a period of 150 hours without removing either the admission or mixing valves for cleaning.

It should not be found necessary in commercial practice, to remove the piston for the purpose of cleaning, more than once in six months.

The operation of the producer is uniform, and the gas delivered to the engine varies only slightly during a ten hours' run. The removal of ashes, and the cleaning of the fires, can be done without interfering with the operation of the engine; due to a change in the quality of the gas.

Attendance.

A peat-producer-gas-power-plant of the size installed in the Fuel Testing Station can safely be left in the hands of an intelligent labourer after he has received, for a week or so, instructions in the handling of the plant, from a competent engineer. The services of only one man are required to run this plant when it is operated on day shift work only.

Cleaning of Gas Pipes, Mains, Valves, etc.

It is recommended that the gas pipes leading from the producer to the cleaning system and the tar filter be cleaned once a week, if possible, when the plant is run ten hours a day during the working days of the year. If this

is done, very little will be required to keep the plant in good condition. The admission and mixing valves of the engine will not require cleaning for two weeks or more.

Fuel Consumption.

The consumption of fuel per brake horse-power hour—including stand-by losses—is for *full load, 1·7 lbs. of dry peat, or 2·3 lbs. of peat containing 25 per cent. moisture; for 3-4 load,* the fuel consumption—including stand-by losses—is *2·1 lbs. of dry peat or 2·8 lbs. of peat containing 25 per cent. moisture.*

Cost of Fuel.

In estimating fuel costs, the assumption is made that peat with a moisture content of 25 per cent. can be delivered to the producer for $2 per ton. In order, however, to take advantage of this, or a lower cost for fuel, the power plant will have to be situated at or near the bog where the peat fuel is manufactured. For small plants of the type and capacity described in the foregoing pages this might not prove feasible in many cases; but will prove entirely feasible and practicable when the plants are of large capacity and when the energy developed is transmitted, in the form of electricity, to neighbouring towns and villages, for lighting, power, and other purposes.

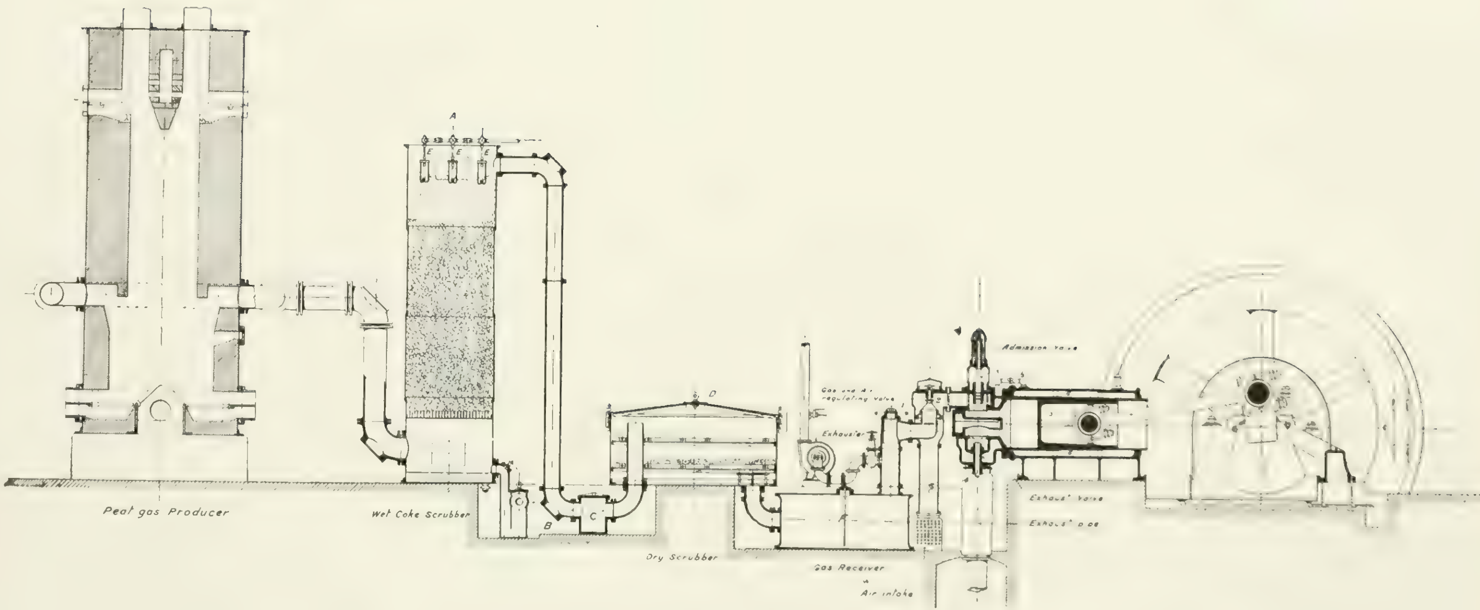
Since the fuel burned in the producer does not require to be of the best quality, the fuel cost may be considerably reduced, since the broken peat bricks and considerable fines—which always occur in the manufacture of peat and otherwise represent a loss—can be efficiently utilized in the producer. Assuming, however, that peat can be delivered to the plant for $2 per ton, and that the plant is run with a power factor of 75 per cent. for 3,000 hours, the fuel costs would be $8.40 per B.H.P. year, including stand-by losses.

Plant Costs.

The first cost of a plant of this type, in comparison with that of other types, should be left for the consideration of those interested in particular cases, by obtaining competitive prices from manufacturers. Local conditions, capacity of plant, etc., changes the first cost so considerably that any figures quoted here might prove misleading.

By-Product Recovery Plants.

In various plants at present utilizing peat for the production of power, the net cost of developing power is considerably reduced by the sale of sulphate of ammonia and tar; which are recovered as by-products. This recovery is attempted only in plants of larger size than the one described in the foregoing pages.



IDEAL SECTION OF KÖRTING PEAT PRODUCER-GAS PLANT

TABLE XIV. (Page 59.)

SUMMARY OF THE RESULTS OF TESTS NOS. 5, 6, 7, AND 8.

Loads carried on engine	1/4	1/2	3/4	Full
Fires cleaned, ashes removed, and hoppers filled	8.00 a.m.	8.00 a.m.	8.30 a.m.	6.00 a.m.
Test started	8.00 a.m.	8.00 a.m.	8.30 a.m.	6.00 a.m.
" terminated	6.00 p.m.	6.00 p.m.	6.30 p.m.	4.00 p.m.
Duration of test, hours	10	10	10	10
Average volts	107.4	111.6	115.7	123.3
" amperes	98.5	192.6	304.1	320.2
" Watts at switchboard	10600	21510	35180	39490
" H.P. at switchboard	14.2	28.8	47.1	52.9
" B.H.P. developed at engine	16.1	32.7	53.6	60.1
" moisture content of fuel, p.c.	37.5	31.8	33.3	35.0
Ash in dry fuel, p.c.	6.0	6.6	6.4	6.1
Calorific value of dry fuel, B.T. units per lb.	9460	9460	9440	9500
Total fuel fired, lbs.	965	1060	1580	1555
Average fuel consumption per hour, lbs	96.5	106	158	155.5
" " " B.H.P. hour as fired, lbs.	6.14	3.25	2.95	2.59
" " " B.H.P. hour as calculated to 25 p.c. moisture, lbs.	5.12	2.95	2.62	2.24
" " " B.H.P. hour as calculated dry lbs.	3.84	2.22	1.97	1.68
Water consumption, gals. per B.H.P. hour, producer	16.6	10.31	5.9	4.98
Water consumption, gals. per B.H.P., engine	5.4	2.60	2.1	2.08
Speed of engine, revs. per minute	20.1	2.00	1.98	1.98

(Table XIV shows results of tests made before alteration, and the following tables XV and XVI, results after alteration of the gas producer.)

TABLE XV. (page 87)

TRIALS WITH ALFRED PEAT, AIR OPENING FOR FULL LOAD ON GAUGE

1. No. of trial	20	21	
2. Date of trial	Sept. 19	Sept. 20 and 21	1911
3. Time of starting	11.30 a.m.	10.10 a.m.	
4. Time of stopping	9.30 p.m.	6.10 a.m.	
5. Duration	10	20	hrs
6. Total peat charged during trial	1250	2450	lbs.
7. Total ash and clinker drawn during trial	60	116	"
8. Total peat used for banking and starting		431	"
9. Total peat used during trial and for banking and starting		2881	"
Particulars of Peat Used.			
10. Moisture p.c. in peat as charged	31.4	30.2	
Proximate analysis of dried peat as charged.			
11. Fixed carbon	29.5	30.0	per cent.
12. Volatile matter	64.8	64.6	"
13. Ash	5.7	5.4	"
14. Calorific value of dry peat	9470	9450	B.T.U. per lb.
15. Calorific value of peat as charged	6500	6600	B.T.U. per lb.
16. Combustible matter in refuse withdrawn during trial	53.4	29.7	per cent.
17. Barometer reading	29.85	29.88	inches
18. Wet bulb (in producer room)		59.2	°F
19. Dry bulb (in producer room)		67.1	°F
20. Humidity (in producer room)		64.8	per cent.
21. Average suction at producer exit	0.6	0.5	inches of water
22. " " after coke scrubber	4.3	2.6	inches of water
23. " " " tar filter	4.7	4.7	inches of water
24. " " " dry scrubber	5.7	5.4	inches of water
25. Temperature of gas leaving producer in No. 1 exit	469	475	°F
Engine and Generator.			
26. Average revolutions per minute of engine	190	190	
27. Temperature of outlet cooling water	111	115	°F
28. Average kilowatts delivered to switchboard	35.3	35.2	
29. Average electrical horse-power	47.3	47.2	
30. Efficiency of dynamo	0.88	0.88	
31. Average brake horse-power of engine	53.8	53.7	

TABLE XV—*Concluded.*

TRIALS WITH ALFRED PEAT, AIR OPENING FOR FULL LOAD ON GAUGE—Concluded.

Gas Analysis, per cent. by volume Sample taken after passing tar filter.	10 samples	20 samples	
32. Carbon dioxide	10.8	9.9	per cent.
33. Ethylene	0.5	0.4	"
34. Oxygen	0.5	0.3	"
35. Carbon monoxide	17.7	20.2	"
36. Methane	2.4	2.4	"
37. Hydrogen	10.2	10.3	"
38. Nitrogen	57.9	56.5	"
39. Inflammable gas	30.8	33.3	"
40. Calorific value from analysis (gross)	122	128	B.T.U. per cub. ft.
41. Calorific value from analysis (net)	113	120	
42. Average net calorific value from recording gas calorimeter	123	127	
RESULTS OF TESTS.			
43. Total peat charged during trial	1250	2450	lbs.
44. Total dry peat charged during trial	858	1710	"
45. Total ash and clinker drawn during trial	60	116	"
46. Ash and clinker drawn per cent. of peat charged	4.8	4.7	
47. Ash and clinker drawn per cent. of dry peat charged	7.0	6.8	
48. Average kilowatts delivered to switchboard	35.3	35.2	
49. Average brake horse-power of engine	53.8	53.7	
Hourly Quantities.			
50. Lbs. of peat charged	125	122	
51. Lbs. of dry peat charged	86	86	
Economic Results.			
52. Peat charged per K. W. hour	3.54	3.47	lbs.
53. Dry peat charged per K. W. hour	2.44	2.44	"
54. Peat charged per B.H.P. hour	2.32	2.27	"
55. Dry peat charged per B.H.P. hour	1.6	1.6	"
56. Overall thermal efficiency of engine and producer	16.8	16.9	per cent.
Results Deducted from Fuel and Gas Analyses.			
57. Air supplied to producer per lb. of dried peat charged	39.2	37.6	cub. ft.
58. Water supplied to producer per lb. of dried peat charged	0.47	0.46	lbs.
59. Cubic feet of gas produced per lb. of dried peat charged	53.4	52.6	
60. Heat equivalent of gas produced per lb. of dried peat charged	6040	6310	B.T.U.
61. Producer efficiency	63.8	66.8	per cent.
62. Cubic feet of gas delivered to engine per hour	4590	4520	
63. Cubic feet of gas delivered per B.H.P. per hour	85	84	
64. Heat equivalent of gas delivered per B.H.P. per hour	9660	10100	B.T.U.
65. Thermal efficiency of engine (B. H. P. basis)	26.3	25.2	per cent.

Table XVI.

TRIAL WITH FARNHAM PEAT, AIR OPENING FOR ¾ LOAD ON GAUGE.

1.	No. of trial	24	
2.	Date of trial	Oct 5	1911
3.	Time of starting	9.30 a m	
4.	Time of stopping	7 30 p m.	
5.	Duration	10-00	hrs.
6.	Total peat charged during trial	1,102	lbs.
7.	Total ash and clinker drawn during trial	125	"
8.	Total peat used for banking and starting	155	"
9.	Total peat charged, including that used for banking and starting	1,257	"
	Particulars of Peat Used.		
10.	Moisture per cent. in peat as charged	27.8	
	Proximate analysis of dried peat as charged.		
11.	Fixed carbon	29.9	per cent.
12.	Volatile matter	65.1	"
13.	Ash	5.0	"
14.	Calorific value of dry peat	9730	B.T.U. per lb.
15.	Calorific value of peat as charged	7020	B.T.U. per lb.
16.	Combustible matter in refuse	43.1	per cent.
17.	Barometer reading	30.00	inches
18.	Wet bulb thermometer	51	°F
19.	Dry bulb thermometer	62	"
20.	Humidity	46	per cent.
21.	Average suction at producer exit	0.4	in. of water
22.	" " after coke scrubber	2.8	in. of water
23.	" " " tar filter	5.5	in. of water
24.	" " " dry scrubber	6.2	in. of water
25.	Average temperature of gas at producer exit No. 1	621	°F
26.	Initial reading of water meter for producer and scrubber	3792	cub. ft.
27.	Final reading of water meter for producer and scrubber	4482	"
28.	Difference	690	"
29.	Time between readings	10	hrs.
	Engine and Generator.		
30.	Average revolutions per minute	194	
31.	Average temperature of outlet cooling water	113	°F
32.	" indicated horse-power (gross)	52.2	
33.	Average kilowatts delivered to switchboard	27.1	
34.	" electrical horse-power	36.3	
35.	Efficiency of dynamo	0.88	
36.	Average brake horse-power of engine	41.3	
37.	Mechanical efficiency	79.0	per cent.
38.	Initial reading of water meter for engine	8964	cub. ft.
39.	Final reading of water meter for engine	9312	"
40.	Difference	348	"
41.	Time between readings	10	hrs.

Table XVI—*Concluded.*

TRIAL WITH FARNHAM PEAT; AIR OPENING FOR ¾ LOAD ON GAUGE—Concluded.

	Gas Analysis per cent.		
	By volume, sample taken after passing tar filter, average of 10 samples.		
42.	Carbon dioxide	8.5	per cent.
43.	Ethylene	0.4	"
44.	Oxygen	0.3	"
45.	Carbon monoxide	22.4	"
46.	Methane	2.1	"
47.	Hydrogen	10.0	"
48.	Nitrogen	56.3	"
49.	Inflammable gas	34.9	"
50.	Calorific value from analysis (gross)	132	B.T.U. per cub. ft.
51.	Calorific value from analysis (net)	124	
52.	Net calorific value from recording gas calorimeter	129	
	RESULT OF TESTS.		
53.	Total peat charged during trial	1102	lbs.
54.	Total dry peat charged during trial	794	"
55.	Total ash and clinker drawn during trial	125	"
56.	Ash and clinker drawn per cent. of peat charged	11.3	
57.	Ash and clinker drawn per cent. of dry peat charged	15.7	
58.	Average kilowatts delivered to switchboard	27.1	
59.	Average brake horse-power of engine	41.3	
	Hourly quantities—		
60.	Lbs. of peat charged	110	
61.	" " dry peat charged	79	
62.	Cub. ft. of water to producer and scrubbers	69.0	
63.	" " " engine	34.8	
64.	Gallons of water to producer and scrubbers	430	
65.	" " " engine	216	
66.	Peat charged per K.W. hour	4.06	lbs.
67.	Dry peat charged per K.W. hour	2.91	"
68.	Peat charged per B.H.P. hour	2.66	lbs.
69.	Dry peat charged per B.H.P. hour	1.91	"
70.	Overall thermal efficiency of engine and producer	13.7	per cent.
71.	Gallons of water used per B.H.P hour, by producers and scrubbers	10.4	
72.	By engine	5.23	
	Results Deduced from Fuel and Gas Analysis.		
73.	Air supplied to producer per lb. of dried peat charged	34.8	cub. ft.
74.	Water supplied to producer per lb. of dried peat charged	0.40	lbs.
75.	Cubic feet of gas produced per lb. of dried peat charged	48.6	
76.	Heat equivalent of gas produced per lb. of dried peat charged	6030	B.T.U.
77.	Producer efficiency	62.0	per cent.
78.	Cubic feet of gas delivered to engine per hour	3840	
79.	Cubic feet of gas delivered per B.H.P. per hour	93	
80.	Cubic feet of gas delivered per I.H.P. per hour	74	
81.	Heat equivalent of gas delivered per B.H.P. per hour	11500	B.T.U.
82.	Thermal efficiency of engine (B.H.P. basis)	22.1	per cent.
83.	Heat equivalent of gas delivered I. H. P. per hour	9160	B.T.U.
84.	Thermal efficiency of engine (I.H.P. basis)	27.9	per cent.

COMMERCIAL UTILISATION OF PEAT FOR POWER PURPOSES.*

By Mr. H. V. Pegg.

The question of the utilisation of peat fuel for power purposes has received a large amount of attention from engineers for many years past. Efforts in this direction have mostly taken the shape of some form of preparation of peat fuel in order primarily to get rid of the superabundant moisture in the fuel. Very large sums of money have been spent on peat-preparing machinery with generally very inadequate results; hence it has always appeared to the author that, in order to bring the utilisation of peat to a commercial level, the first consideration would be the utilisation of the peat as far as possible in the condition in which it leaves the boglands without any preliminary and expensive machine treatment.

The author had the opportunity, about seven years ago, of experimenting with air-dried, hand-cut peat fired into a special form of gas-producer. With all gas-producers using bituminous fuel, the main trouble is to get rid of the tarry by-product. In this instance the gas-producer was arranged to work intermittently, there being periods of "blowing" during which the fuel in the producer was urged to incandescence, and periods of gasmaking during which the tarry by-products were passed through the incandescent fuel, where they were split up into gas. The chief difficulty experienced with this plant was the high thermal value of the gas generated, about 330 B.T.U. Owing to the high and varying percentage of hydrogen in the gas, it proved unsuitable for use in the works gas engine; and although the plant was running more or less continuously for ten days driving the whole works, very considerable trouble was experienced, not only in the engine, but also in the plant, owing to the varying moisture content of the peat, the producer plant being decidedly sensitive in regard to this latter point.

From the experience then gained it appeared evident that it would be wiser to extract the tar from the gas rather than to try to utilise the same by converting it into gas, and, further, that the producer must be comparatively non-sensitive to the amount of moisture in the peat fuel. Some two years ago the author discussed the question of the utilisation of air-dried peat fuel with Mr. Hamilton Robb, of Portadown, who, having large supplies of such fuel convenient to his factory at Portadown, was strongly of opinion that it should be possible to utilise such fuel in order to generate the power required in the factory. As the result of various tests run with an experimental plant at

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*A paper read at the Belfast meeting of the Institution of Mechanical Engineers, July, 1912, by Mr. H. V. Pegg. (From "The Colliery Guardian," Aug. 9th, 1912).

the works of Messrs. Crossley Brothers, Openshaw, a special plant was eventually manufactured by them under their designs and patents and to the author's specification. This plant, which has been running since last September, has been so often dealt with in the daily and technical Press that there is no need for the author to dwell upon the details of the plant, but he proposes to make a few remarks in regard to the difficulties experienced.

Air-dried peat is not a very convenient fuel to fire into the producer, and as it was uncertain whether it would be possible to burn the fuel direct in the form in which it came from the boglands, provision was originally made in the plant to deal with peat fuel prepared by being reduced in size to blocks of about 5 in. cube, but it was found possible to dispense with the preliminary treatment, and the construction of the plant was thereby considerably simplified.

As regards the general running of the plant, last October it was subjected to a test run of six hours' duration with a load of 250 b.h.p., the peat consumption per b.h.p.-hour averaging 2.55 lb., the peat fuel containing 18.98 per cent. of water; this was with both producers running, although the load was considerably below the total capacity of the plant. When necessary it has been found that the above load can be safely carried with either producer working singly, and the plant has run under these conditions for several days.

It will be noted that the percentage of moisture in the fuel during the above test was unusually low. This was owing to the unusually dry summer of 1911. During November, and especially December last, the fuel fed to the plant was extremely wet, as the rainfall in those months was very heavy, and the fuel supply was and is entirely exposed to the weather. The plant, however, worked just as well with sodden peat as it did with the drier peat, the only difference being the amount of fuel consumed. The amount of water in this "sodden peat" varied considerably from day to day, and the exact percentage was not arrived at; as near as could be estimated it was at least 70 per cent.

The separation of the tar from the gas was the chief difficulty to be overcome; it was found far better to rely on an ample water-spray through which the gas passed rather than any form of a coke-scrubber, as the coke rapidly became clogged with tar. The main portion of the tar was thrown out into a tar sump by a centrifugal tar extractor; but unless the gases were subjected to a thorough washing and cooling by the water-spray above referred to, it was found that a certain proportion of tar got past the extractor, collected in the gas mains and finally found its way into the gas engines. It was a matter of experiment as to the precise amount of water sprayed into the cooler which was necessary in order to insure that the tar vapour should be sufficiently condensed before reaching the centrifugal extractor, so as to enable the extractor

to effect the needful separation. As now arranged, the proportion of tar in the gas after passing the extractor is small, and the engine valves do not want cleaning out more than once a week.

When first started, the plant generally, and especially the producers, required a thorough cleaning once a week; at the present date the plant can be run, if necessary, for three weeks without cleaning, though the weekly cleaning generally takes place as a matter of policy. This result has been obtained owing to the increased amount of washing water used, which now amounts to about 7 gallons per b.h.p. per hour. The proportion of tar recovered is about 5 per cent. of the weight of fuel consumed, and during the initial stages of the running of the plant a certain amount of this tar was sold to tar-felt manufacturers at a price of 35s. per ton, but sales in this direction ceased owing to an, at present, ineradicable pyroligneous odour which persistently clings not only to the tar itself, but to all the various oils distilled therefrom.

Experiments have also been made with the tar in oil-burning boilers, but owing to the very high percentage of water in the tar—up to 50 per cent.—and the large quantity of solid matter also present, a very large amount of preliminary treatment is necessary. For a considerable period the tar at Portadown was used mixed with coal and burnt under a Stirling boiler; the precise heating value of the tar so consumed has not, however, been ascertained. At the present time the whole factory at Portadown is run entirely on peat fuel, the consumption being about 44 tons per week, of which the producer plant takes about 22 tons. The nature of the peat varies considerably; with good black heavy peat the weekly consumption for all purposes drops as low as 35 tons; and with light top peat from the surface of the boglands the consumption rises to 54 tons. It is also interesting to note that the quality of the peat is reflected in the carrying capacity of the barges, which bring a load of 35 tons with heavy peat and 24 tons light peat. The peat is unloaded from the barges and conveyed to the producer platform and boiler house by a transporter. Clinker troubles are not often experienced, and only when burning the inferior grade of peat, the presence of sand in the fuel causing the trouble.

The author is indebted to Mr. W. A. Mullen, manager at the factory of Messrs. Hamilton Robb Limited, for the following figures in regard to the cost of fuel, these figures being given on June 12 last:—

Cost of running factory on coal per week:—

	£	s.	d.
8½ tons of anthracite at 35s.	14	17	6
19 tons of steam coal at 17s.	16	3	0
	£31	0	6

Cost of running factory on peat per week:—

Say up to 50 tons of peat at 6s.	15 0 0
Weekly saving	£16 0 6

Allowing for 15s. for extra labour, the net weekly saving figures out at £15 5s. 6d.

The author would here refer to the letter in *Engineering* of January 26 last, in which the general manager of the Power Gas Corporation Limited gives some very interesting particulars in regard to peat plants, more especially an ammonia recovery plant working in the south of England. It would be of great interest if some figures as to the working costs of this plant could be laid before this meeting. It will be noted that plant is worked with ammonia recovery, which would mean a very much larger plant than that at Portadown. The amount of the nitrogen in the south of England peat is apparently high, and would appear to be considerably more than in the peat used at Portadown, analysis of which is appended hereto, together with analysis of the refuse tar and gas from the producer.

Much frothing occurred until the water was distilled off. Towards the end the temperature went higher than a mercury thermometer will record (360 degs. Cent.). The different fractions obtained were as follows:—

(1) Water, faintly acid to litmus. Phenol could not be detected.

Analysis of Tar made by Messrs. Potton and Hawthorne.

Sample of Tar No. 2.

The sample was grey when received, but very quickly turned black. On distillation it yielded:—

	Per cent.
1. Water	37·2
2. Light oils (distilling below 230 degs. Cent.)	5·8
3. Middle oils (distilling at 230-270 degs. Cent.)	8·3
4. Heavy oils (distilling above 270 degs.)	23·2
5. Coke	17·8
6. Loss	7·7
	100·00

ANALYSIS OF SAMPLE OF PEAT.

(Received on September 14 from Mr. Hamilton Robb, Portadown.)

Proximate Analysis.

	Per cent.
Water	18·98
Volatile matter	55·17
Fixed carbon	24·75
Ash	1·10
	100·00

Ultimate Analysis.

	Per cent.
Carbon	44·60
Hydrogen	5·42
Nitrogen	0·97
Ash	1·10
Moisture	18·98
Oxygen (by difference)	28·93
	100·00

ANALYSIS OF AVERAGE SAMPLE OF GAS DURING A 10 HOURS' TRIAL.

Moisture in Fuel 26 per cent.

CO_2	10·6
CO	21·0
H_2	13·0
CH_4	3·7
Total combustible	37·7 per cent.
Calorific value (calculated from analysis)	144·0 B.T.U.

(2) Light oils (below 230 degs. Cent.) became rapidly dark red in colour. Specific gravity of crude liquid 0·930.

(3) Middle oils (230-270 degs. Cent.) became dark red. Specific gravity of crude liquid 0·944.

(4) Heavy oils (above 270 degs. Cent.) on standing, crystals of paraffin wax separated out to the extent of 5.42 per cent. of the fraction (equal to 1.26 per cent of the original tar). The specific gravity of the liquid portion of this fraction was 0·906.

EUROPEAN POWER PLANT PRACTICE.

Tar Oil as a Fuel for Diesel Engines.

By Francis G. Wickware.

(From the Practical Engineer.)

Five years ago the manufacture of Diesel engines in Germany was thrown open to competition through the expiration of Dr. Diesel's fundamental patents. Many firms immediately began the manufacture of oil motors of the Diesel type. and the rivalry among them has had the usual large effect on the development of the Diesel engine.

One of the most important directions in which this development has proceeded has been in the adaptation of the motor to operation on fuels other than crude oil or its derivatives. Germany has no petroleum deposits, and fundamentally the problem of securing the position of the Diesel motor in competition with steam and gas engines was one of discovering reliable supplies of cheap fuel of domestic origin.

The recent successful experiments with gas-works tar have already been described in Practical Engineer. These followed logically upon the adaptation of the Diesel motor to operation on tar oil, the possibilities of which were recognized long before the stress of competition led to its practical application as a fuel.

Tar oil is produced in Germany in quantities largely in excess of ordinary demands, and while its use in Diesel engines is not now very extensive, yet the annual consumption for power purposes is some thousands of tons. The fuel is rapidly gaining in popularity, and a recent writer in Gluckauf predicts a consumption this year of 20,000 to 30,000 tons.

Qualities demanded of tar oil for use in Diesel engines are these: It must not contain more than 0.2 per cent. xylene, more than 0.05 per cent. incombustible matter, or more than one per cent. water. At least 60 per cent. by volume must be volatile at 572 degrees F., and the oil must be fluid at 59 degrees F., while the flash point must not be lower than 149 degrees F.

The largest unit yet built for operation on tar oil developes 4,000 h.p., while units of 600 to 800 h.p. are common. Above this limit of power, tar oil engines are exclusively of the horizontal type; below they may be either vertical or horizontal. Engines up to 600 to 800 h.p. have 1 to 4 cylinders on a single crankshaft. The lower limit of power for tar-oil engines is 50 h.p., below which they are not efficient.

As in operation on tar, a certain amount of a lighter oil is required, in most cases, to promote ignition. Paraffin oil or kerosene is commonly used, in amount 5 to 10 per cent. of the tar oil, though recently the proposal has been made to use benzol. The manufacturers are now trying to devise means of avoiding the use

of ignition oil except for starting. One is experimenting with very high compression; another is trying the effect of pre-heating the fuel by means of the waste gases or the jacket water. In all cases, of course, it is possible to run temporarily on tar oil alone under favourable working conditions. With the ignition oil, however, all difficulties of operation are entirely removed. Ignitions are regular, there is little variation of pressure, and the engine adjusts itself to changes of load with steadiness and reliability.

As to the general reliability of the tar-oil motor, the makers guarantee it to be as high as that of the best steam engines, with no higher maintenance charges. In the many plants operating units of 50 to 1,600 h.p., the valves and pistons have given no trouble when properly cared for, and the wear is very small. On account of the fact that it is impossible to eliminate sulphur from the fuel, however, the parts which come in contact with the oil have to be made of special materials. The use of copper-zinc alloys is forbidden; hence, the parts usually made of brass or phosphor bronze are made of pure nickel or 25 per cent. nickel steel.

The consumption of fuel is constant over long periods of operation, and the economy under varying load is very favorable. The results of three months' operation of a 200 h.p. motor are given in the paper under review. In 780 working hours, 86,470 kw. hr. were developed with a total fuel consumption of 32.56 tons. The average consumption per kilowatt-hour was, therefore, 0.755 lbs., or per horse-power-hour, 0.482 lb.

At the prevailing market price of tar-oil, $9.00 per ton, the fuel cost per horse-power-hour was 0.22 cent. During the period the motor was subjected to sudden and considerable changes of load, at times reaching 20 per cent. overload, though the average was considerably under rated load. The consumption of lubricant was small, about 0.18 gal. per hour. Similar results have been obtained in tests of a 60 h.p. motor in the works of the Gasmotorenfabrik Deutz. Taking the cost of tar-oil at $9.00 per ton and of gasoline for ignition at $22.50 per ton, the fuel cost per horse-power-hour worked out as follows: At full load, 0.22 cent; at $\frac{3}{4}$ load, 0.24 cent; at $\frac{1}{2}$ load, 0.27 cent; and at $\frac{1}{4}$ load, 0.37 cent.

Including all accessories, the cost of a 120 h.p. tar-oil motor installed is about $7,500, and of a 440 h.p. unit $18,750. A careful estimate of the first and operating costs of 120,440 and 1,000 h.p. units is as follows:

	1,000 h.p.	400 h.p.	120 h.p.
First cost	$37,500	$18,125	$7,250
Annual operating cost:			
3,000 hours per year	12,050	6,000	2,315
8,600 hours per year	26,325	12,325	4,475
Operating cost per h.p. hour, cents:			
3,000 hours per year	0.4	0.45	0.64
8,600 hours per year	0.3	0.32	0.44
Fuel cost per h.p. hour, cents:			
3,000 hours per year	0.23	0.23	0.23
8,600 hours per year	0.23	0.23	0.23

PRESENT STATUS OF THE DIESEL ENGINE.

Following his election to honorary membership in the American Society of Mechanical Engineers, on April 30th, Dr. Rudolph Diesel, inventor of the well-known engine bearing his name, delivered a lecture upon "The Present Status of the Diesel Engine." While the general scope of the lecture was along much the same lines as his London address of some weeks ago, and many of the points had been brought out from time to time in the technical press, still the paper covered in logical order the development of the Diesel engine from its inception to its present position as an important commercial factor. Furthermore, many points were brought out which are not of common knowledge, especially as applied to American practice.

Fuel.

By way of introduction, Dr. Diesel pointed out the influence which his engine is having upon the coke and gas industries in Europe, the by-products from these, such as tar and creosote oils as now produced, being especially adaptable for use in the Diesel engine. Of course this is not of so great importance in the United States on account of its richness in natural oil, but it is of utmost importance to those countries which have practically no oil production of their own. For instance, it is estimated that the tar production of Germany is sufficient for furnishing approximately $1\frac{3}{4}$ million h.p. for 300 days of ten hours each per year.

Dr. Diesel also called attention to the fact that it is possible to use vegetable and animal oils in his engine, a fact not generally known. While this is insignificant at present, in the course of time it may play an important part.

. . . .

Dr. Diesel stated the aggregate of Diesel engines in the United States is at present about 300 units, having a combined horse-power of 150,000. He then showed views of a number of these plants. The largest is that of the Prairie Pebble Phosphate Company at Mulberry, Fla. This comprises sixteen Diesel engines arranged in eight double units of 450 h. p. each, and served by five air compressors.

Another important American Diesel engine plant is that of the United Gas Improvement Co., in Philadelphia, which has three 255-h. p. engines.

. . . .

Marine Engines.

In reviewing the application of his engine to marine practice, Dr. Diesel stated that at the start attempts were made to make the four-stroke-cycle

engine reversible. This resulted in a very complicated mechanism, and although a few of these are still being built, this type has almost entirely given place to the reversible two-stroke-cycle engine, which for marine work also embodies other advantages, such as less weight, etc.

Very important experimental work is now being carried on for the purpose of developing high-power marine engines with cylinder units reaching 1,000 to 2,000 h. p. with single acting piston, which permits free expansion of the cylinder under the action of high temperatures.

Dr. Diesel stated that there were at present 365 ships fitted with Diesel engines. One of these, around which popular interest centres, is the "Fram," in which Captain Amundsen made his successful trip to the south polar regions.

Also two submarines for the United States Navy are being fitted out with Diesel engines.

Diesel Locomotive.

One of the most interesting points covered by Dr. Diesel's lecture was the application of his engine to locomotives. This is an entirely new phase of the subject and, although experiments have been in progress for the past five years at the Winterthur works of Sulzer Bros., practically nothing has heretofore been made public regarding it.

The first locomotive which is of 1,200 h. p. has just been completed and is at present undergoing tests. The application of the Diesel engine to locomotive practice presented a rather difficult problem, owing to the difficulties of manoeuvering with this type of motor, and to the limitations in space and weight.—"Power," May 28, 1912.

THE INTERNAL COMBUSTION ENGINE AND THE GAS PRODUCER.

There has been considerable discussion recently concerning the longevity of the coal fields of the country. With the increasing depletion of the coal deposits there has been a momentum given to hydro-electric installations, and an increasing demand for information concerning the possibilities of power from the internal combustion engine and the gas-producer. Only last week we noted in the "Canadian Engineer" that the Province of Saskatchewan had appointed a consulting engineer to make an exhaustive report on the lignite deposits of the Province and their power-producing possibilities. The United States Bureau of Mines has been conducting investigations into the possibility of generating producer gas for power purposes in a commercial way from the various mineral fuels of the country. These investigations have been associated with steaming, briquetting, coking, and other tests, all of which supplemented an examination into the nature, extent and distribution of the fuels used. The tests have been used with carefully selected representative samples and carload lots of coal, lignite, etc., procured especially for the purpose by experienced collectors.

The investigations have shown the adaptability of the gas-producer for the utilization of low-grade coal, lignite, peat, etc. As mined, these fuels cannot be used in boiler furnaces and will not bear long transportation, but the gas-producer makes them of potential value. Where deposits of low-grade coal, lignite, and peat are found, the present cost of power, as developed in steam plants with coal that has been shipped a considerable distance, can be materially reduced by placing producer plants at the mines or bogs so as to utilize these low-grade fuels without cost of shipment by generating electric current, which can be easily transmitted to desired points within a wide radius.

The tests in the gas-producer have shown that many fuels of so low grade as to be practically valueless for steaming purposes, such as slack coal, bone coal, and lignite, may be economically converted into producer gas, and may thus generate sufficient power to render them of high commercial value.

It is estimated that on an average each coal tested in the producer-gas plant developed two and one-half times the power that it would develop in the ordinary steam boiler plant. Investigations into the waste of coal in mining have shown that it probably aggregates 250,000,000 to 300,000,000 tons yearly, of which at least one-half might be saved. It has been demonstrated that the low-grade coals, high in sulphur and ash, now left underground, can be used economically in the gas-producer for the ultimate production of power, heat, and light, and should, therefore, be mined at the same time as the high-grade

coal. The investigations also show that the general use of gas-producers for the development of power means the elimination practically of the smoke nuisance. This result is especially important in cities that are compelled to use bituminous coals. The great saving in fuel obtained through the gas-producer has led to the installation within the last decade of several hundred of these power plants throughout the country. These producer plants are practically smokeless during operation. The establishment of producer-gas plants at the mines and the distribution of electric energy or gas over large areas will also tend to eliminate smoke. When a large percentage of the small, isolated power and heating plants and all steam locomotives have been removed from the larger cities, the atmosphere of these cities will be much clearer, and heavy financial losses directly traceable to smoke will be eliminated.—"The Canadian Engineer."

PEAT, AND ITS UTILIZATION FOR POWER PURPOSES.

The successful utilization of peat for power production on a large and economical scale at Portadown, Ireland, would appear to fully justify the convictions so forcibly and frequently expressed by Dr. Eugene Haanel, Director of Mines for the Dominion, concerning Canadian potentialities in this regard. The conditions are ripe, in Ontario at least, for experimentation on the part of industrial concerns, to determine how cheaply power may be developed in certain districts from peat fed to gas producers. Really, that is the only point upon which more precise data is, perhaps, desirable or necessary. Not long since, when reporting on an important copper property near Temagami, Mr. Jno. E. Hardman strongly recommended that for the operation of a plant and for the generation of power required for the local reduction of the ores, the peat bogs of that neighborhood be turned to account. There are many other localities where conditions are similar and where the utilization of peat would enormously benefit and cheapen the cost of mining.—The Canadian Mining Journal.

PEAT AS AN AGRICULTURAL ASSET.

Extracts from paper read by Thomas S. Gladding, A.M., New York, at Kalamazoo Meeting of the American Peat Society.—Journal of the American Peat Society, Vol. v., No. 1.

What is a peat-bog in the eyes of the agriculturist? Simply an immense natural manure pit, provided by the kindness of past centuries, to be conserved and utilized by the modern farmer.

A brief study of soils as they are found at the present day will point out the proper method of application of this valuable deposit. Wiley, in his "Agricultural Analysis," gives eight kinds of soil, as follows:

"1. Sand. Soils consisting almost exclusively of sand.

"2. Sandy Loams. Soils containing some humus and clay, but an excess of sand.

"3. Loams. Soils inclining neither to sand nor clay and containing some considerable portions of vegetable mold, being very pulverulent and easily broken up into loose and porous masses.

"4. Clays. Stiff soils in which the silicate of alumina and other fine mineral particles are present in large quantity.

"5. Marls. Deposits containing an unusual proportion of carbonate of lime, with often some potash or phosphoric acid resulting from the remains of sea animals and plants.

"6. Alkaline. Soils containing carbonate and sulfate of soda, or an excess of these alkaline and other soluble mineral substances.

"7. Adobe. A fine-grained, porous earth of peculiar properties hereinafter described.

"8. Vegetable. Soils containing much vegetable debris in an advanced state of decomposition. When such matter predominates or exists in large proportion in a soil the term tule, peat or muck is applied to it."

A few years since I visited a coral island in the Caribbean Sea, investigating a phosphate deposit. The soil was practically a pure carbonate of lime, or chalk. This soil is an illustration of soil number five, or a marl soil. Large areas of Long Island are almost pure sea sand and illustrate class number one. These soils are practically worthless for agricultural use. The addition of organic matter will convert them into fertile soil. I have traveled over the great wheat fields of western Canada and seen a farmer turning up with his plow the rich black loam that exists to a depth of three feet or more.

What constitutes the difference between the worthless sand soil and the

worthless chalk soil and the rich black loam? Principally the presence in the latter of a large amount of thoroughly decomposed organic matter that constitutes what we call humus or humus material.

What now are the beneficial results of mixing peat, rich in humus, with soils deficient in vegetable matter?

1. The first beneficial result is the **lightening** of the soil.

The weights of a cubic foot of different kinds of soil, as given by Schubler, are as follows:

	Pounds.
Sand	110
Sand and clay	96
Common arable soil	80 to 90
Heavy clay	75
Vegetable mold	78
Peat	30 to 50

In general the specific gravity of soil decreases inversely as its content of humus.

A study of these figures shows that if we add to a heavy soil composed of sand weighing 110 pounds per cubic foot, an equal amount of peat weighing 40 pounds per cubic foot, we shall have a resulting soil weighing 85 pounds per cubic foot. If a soil of mixed sand and clay weighing 96 pounds per cubic foot is mixed with peat weighing 40 pounds per cubic foot, the resulting soil will weigh 68 pounds per cubic foot.

2. The second beneficial result is in the increased **absorption of solar** heat by such a soil.

"The quantity of heat absorbed from the sun by the earth is an important factor in the growth of vegetation. As has been established in the physics of heat, a black surface, other things being equal, will absorb a larger amount of heat than one of any other color, so that, other things being equal in the physical and chemical composition of a soil, variations in the amount of organic matter producing greater or less black coloration will affect the heat absorption. Thus, black soils, in the conditions above mentioned, will absorb more heat than lighter colored soils. As a result, the vegetation in such soils gets an earlier start in the spring and matures more rapidly. As an illustration of this it may be noted that the black prairie soils of Iowa produce uniformly crops of maize which mature before the early frosts, while crops grown on lighter soils much farther south often suffer injury from that source."

3. The third beneficial result is the **increased capacity** of the soil to **absorb and retain moisture.**

I quote some experiments from Wiley on this subject:

"A sample of soil from the beet sugar station, in Nebraska, gave the following results:

"First trial .... 45.75 per cent. water absorbed.

"Second trial .... 44.85 per cent. water absorbed.

"Muck soil from Florida, containing varying proportions of sand, gave the following numbers:

"Soil number one, 144.85 per cent. and 145.43 per cent. Soil number two, 109.13 per cent. and 107.93 per cent. Soil number three (very sandy), 46.86 per cent. and 46.51 per cent."

As the percentage of peat increases, the capacity of the soil to absorb and retain water also increases.

4. The fourth beneficial result is the **slower evaporation,** or decreased coefficient of evaporation.

If a number of zinc boxes are filled with different kinds of soil and exposed to the sunlight, it will be found that "the rapidity of evaporation in the samples of soil rich in humus and clay will be decreased as compared with the sandy soils."

Let us recapitulate briefly the four advantages that are obtained by the mixture of humus soils with other soils.

1. The lightening of the soil.
2. The increased absorption of solar heat.
3. The increased capacity to absorb and retain water.
4. The slower loss of water from evaporation.

The above four advantages which are obtained by the admixture of peat soil or humus soil with other soils are wholly physical or mechanical in character. They are wholly apart from the fertilizer ingredients that are present in the peat soil. I have no hesitation in saying that the agricultural value of a peat soil which comes from the four physical properties above mentioned, is far greater than the agricultural value derived from the mere fertilizer ingredients present in such peat soil. When we reflect that a sun-dried peat soil, containing 50 per cent. of dry material, most of which is organic matter, can be bought at the present time for the market value of the mere fertilizer ingredients therein contained, and that all the benefits, which are of far greater value than mere fertilizer ingredients, are obtained free of cost, we see the great importance of urging upon all farmers the importance of using such a valuable material, especially for admixture with clay and sandy soils.

Let us now turn to a consideration of humus soil from a chemical or fertilizer standpoint.

Snyder (Soils and Fertilizers), says: "The term humus is employed to designate the most active of the organic compounds. It is the animal and

vegetable matter of the soil in the intermediate forms of decomposition. Its quality varies with the material from which it is derived. When easily obtained, muck is one of the cheapest forms of nitrogen."

Johnson (Agr. Chemistry): "The organic matter of the soil is chiefly composed of a brown or black substance to which the name humus has been given, composed of compounds of carbon, hydrogen and nitrogen. All these compounds retain ammonia with great tenacity, a property of great utility in connection with the supply of nitrogen to plants. The more organic matter a soil contains the more nitrogen will be present as a rule."

Conn (Soil Bacteriology): "There is a vast difference in the fertility of a sand and a garden soil. Sandy soil may contain all the mineral matters but it lacks the something needed for plant growth which the garden soil contains. This something is called humus. It is the remains of life of previous generations: in a state of decay, plants, animals and micro-organisms contribute to it. Humus is decayed organic matter."

Hilgard (Soils, page 135): "Soil humus is doubtless the chief depository of soil nitrogen and the main source from which, through the process of nitrification, the nitrogen supply of plants is usually derived."

Also page 133: "Not only humus but the insoluble colloid humates produce in the soil a loosening effect, or tilth, which apparently cannot be brought about in any other way."

Hilgard (Soils, page 127): "Normal humus stands very close to peat. Even black peat requires time and aeration (cultivation) and lime neutralization, to serve the purposes of humus in the soil."

Hilgard (page 140, Soils): "Synder has shown that the richer the organic matter is in nitrogen the more energetically it acts in rendering available the mineral matters of the soil for plant nutrition."

Ladd (Bulletins, Dakota Stations, 24, 32, 35, 47): "With the increase of humus in the soil there is a corresponding increase in the amounts of mineral plant foods extracted from the soil by the Grandeau method."

Hilgard (Soils, page 358): "Nitrification for two years between soil containing only actual humus and that containing only decayed matter, showed 14 times more nitrification in the actual humus material, although the undecayed matter was 40 per cent. of the total in the original soil."

Hilgard (Soils, page 357): "The writer believes that the mainly important source of nitrogen to the plant is the nitrification of the humus nitrogen. The unhumified vegetable matter being of no definitely ascertainable value and the nitrates, varying from day to day, being liable to loss by leaching at any time, therefore forming no permanent feature of the soil."

Johnson (pages 155-156): "A due admixture of organic matter is favorable to fertility the more valuable in proportion to the nitrogen it contains."

Conn (Bacteriology, page 63): "Nitrification caused by bacteria is necessary to produce plant food. Ordinary humus will produce plenty. Soil deficient in humus shows little."

Hilgard says humus is the natural food and habitat of the soil bacteria.

Snyder (page 109): "In many of the western prairie soils under cultivation 30 years the humus has been reduced one-half and crop production becomes poor."

Snyder (page 112): "Humus enables soil to store up water and resist drought."

Whitney (Bureau of Soil), states: "Humus renders the soil sanitary, rendering harmless the toxic substances of the soil."

The foregoing authorities practically agree that chemical analyses and culture tests have proved that peat or muck humus in proper condition is

(1) Similar to ordinary soil humus

(2) That its value is in every way enhanced by higher nitrogen content.

(3) That it has many important and essential functions, physical, chemical and biological, in contributing to plant growth.

(4) Hilgard shows that the thoroughly decayed matter or actual humus has much greater value than unrotted material such as the organic matter of soiling crops or manure unhumified.

Prof. Chas. A. Davis, Peat Expert, Bureau of Mines, cites, in a letter, a field test of the North Carolina Experiment Station in 1907 with a crop of cotton, when plots were fertilized with dried blood (ammoniate) and dry peat (as ammoniate), respectively. The plot fertilized with peat showed 53 per cent. increase, while the dried blood plot showed 46 per cent. increase. The amounts of actual nitrogen in the peat and blood were equal.

Also Bulletin No. 204, Wisconsin Agr. Exp. Station: "In these experiments low grade peat combined with 4 lbs. of muriate of potash and 8 lbs. of acid phosphate to the ton was compared with ordinary manure. Each succeeding year for four (4) years results were noted and in the fourth year the originally poor, sandy soil gave a larger yield of corn where the peat was used than the plot fertilized with manure."

H. B. Fullerton (Agricultural Director, Long Island R. R.): "For a number of years we have been seeking something to supply the exhausted leaf mold or vegetable matter which is the prime requisite for vigorous plant growth. Strawy manure, long used to accomplish this end, is at the present day difficult to secure, hard to handle and offensive, hence we have tried everything we could find with varying success until we struck the black vegetable mold or humus from Alphano. This we have tested most thoroughly at both Experimental Stations with universal success, having raised celery, onions, lettuce and many other crops with no other aid on the light, sandy

loam in the central section of Long Island. We have also been able by its use to keep our lawns in superb condition throughout the usual dry season of summer. Hence we have no hesitancy in saying that the utilization of this vegetable matter is a rational method of treating even the unpromising raw material obtained from city cellars, an admixture assuring lasting fertility."

The consensus of expert opinion is unanimous as to the great value of peat as a soil maker, a soil renovator and a fertilizer. The farmer is learning to save and to utilize more carefully his barnyard manure. He is also learning to appreciate the benefits of a wise and intelligent use of commercial fertilizers.

We do not need to depreciate these valuable materials, in order to advocate peat. But we must learn to appreciate the immense value of the greatest natural fertilizer that nature has provided with such generous hand for the agriculture of our day.

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EDITORIAL.

The issue of the present double number of the Journal has been delayed in order to include an abstract from the very able and carefully prepared report by Mr. B. F. Haanel, Chief of the Fuel Testing Division of the Department of Mines on the Utilization of Peat Fuel for the production of power, which appears in the foregoing pages. Mr. Haanel's report, which covers 145 pages, and is splendidly illustrated, is without doubt the most important record of original investigation into the utilization of peat fuel for the production of power yet issued on this continent.

It is divided into two parts, the first of which gives detailed results of experiments conducted at Ottawa with a Korting peat gas-producer as

originally installed by the manufacturers. Part 2 covers experiments with the same plant altered to meet difficulties arising in the first set of experiments, and with a new cleaning system devised by Mr. Haanel. Throughout the report the facts are clearly and logically set forth, and are accompanied by copious details of results and operation, which make it a valuable addition to the literature on the subject. The report is admirably printed on good paper, and the illustrations are excellent. Features which will be welcomed by the general reader are the clear expositions of the theory of producer-gas, and of the principles underlying the operation of the gas engine, which will materially aid in rendering it of service to the ordinary business man who has not a special technical knowledge of the matters dealt with. No person in any way interested in the development of the peat industry should fail to secure a copy of this useful publication, which may be had on application to Dr. Eugene Haanel, Director of Mines, Department of Mines, Ottawa, Canada.

In the February number there appeared a petition addressed to the Minister of Mines, asking for a government investigation of peat gas power installations in Europe, with and without recovery of by-products.

Although the matter is still in abeyance, owing to the transfer of the Mines Branch to the Department of the Interior, and other reasons, it is hoped that, in view of the great economic importance of the proposed investigation, action will be taken upon it some time early in the approaching Session of Parliament.

While the manufacture of air-dried peat fuel for domestic purposes, the establishment of which in Canada was the first object of the government's efforts, must be regarded as of great importance, the production of cheap power from our peat bogs is no less worthy of attention. Peat fuel, being more bulky and low-priced than coal, will not stand the cost of transportation for long distances. Its utilization for power production at, or near, the bog will materially aid in placing the industry on a commercial basis. In some cases, undoubtedly, the latent wealth existing in the peat bogs may be better conserved and utilized to greater economic advantage by the manufacture of other products as well as fuel. Electric energy generated from peat at the bog can be distributed from a central power station, and employed to furnish cheap light and power to a number of places where water-powers are not conveniently available; and its benefits might even be extended to the farming community over considerable areas adjacent to large peat bogs.

Among the valuable by-products obtained are tar and sulphate of ammonia. A wide field for the profitable use of peat tar has lately been opened up by the discovery that tar oils, and even moderately thick tar, can

be used as fuel for Diesel oil engines. The Diesel engine, as appears from an article in the foregoing pages, is coming into very extensive use. A vessel equipped with a Diesel engine, recently put on the St. Lawrence route, has effected great savings in cost of carriage of freight, and it is predicted by a marine expert that the entire Great Lakes fleet will, before long, be equipped to burn oil, with a consequent important reduction in freight charges.

Canadian peat bogs examined are very rich in nitrogen, which can be saved in the form of sulphate of ammonia, a valuable fertilizer selling ordinarily at about $60.00 per ton, but which during the past summer has sold as high as $75.00 per ton. The European market for fertilizers is extensive. Italy alone purchasing to the value of about twenty million dollars. While the local market will be comparatively small at the outset, it is increasing rapidly. According to the Statistical Year Book, our imports of fertilizers in 1902 were valued at $84,996, and in 1903 at $112,256, while last year they exceeded half a million dollars in value. The following table shows imports during the last four years:—

	Dutiable	Free	Total
1908	$259,132	$110,034	$369,166
1909	341,102	131,573	474,675
1910	350,907	130,549	481,456
1911	399,597	146,560	546,157

A very important feature of some of the European installations for production of electric power and by-products from peat gas, is that they can be operated with peat fuel containing a relatively high percentage of moisture, thereby avoiding to a great extent the cost of drying the peat, which has always been one of the outstanding difficulties in its utilization as a fuel.

In the Journal of the American Peat Society for April (Vol. 5, No. 1) appears a paper read at the Kalamazoo meeting in September last, by Mr. L. B. Lincoln, on "An Up-to-date Peat Plant." A reference to the Canadian government plant at Alfred, which it contains, is very misleading and would appear to have been inserted subsequently to the reading of the paper. The paragraph reads:—

"The Swedish system referred to before was investigated and an outfit was purchased by the Canadian Department of Mines. It was imported and set up at Alfred at great cost as a demonstration of the air-drying theory."

"Statements of the final and unsuccessful outcome of this experiment, and how and why it was finally abandoned, are within the reach of all and we can therefore refrain from considering them at the present moment."

The outcome of the operation of the government plant cannot be fairly described as unsuccessful, inasmuch as the object for which it was erected has been fully achieved. It is quite true that Dr. Haanel urged the necessity of substituting mechanical equipment for the hand labour employed at the small demonstration plant, in order to establish the manufacture of peat commercially in Canada. The government plant has never been abandoned, and it did not resume operations during the present season solely because arrangements had been made whereby private capital has stepped in and erected a much larger plant embodying the features recommended by Dr. Haanel for conduct of operations on a large commercial scale. But it should not for a moment be lost sight of that the prime object of the installation of the government plant, viz., demonstration of the manufacture of air-dried machine peat, has been fully and successfully accomplished.

Mr Lincoln discloses in his paper what was probably the chief reason for the unsatisfactory results he obtained last year when he says:—

"The third point in our system consisted during the last season of an exact copy of the 'Anrep' delivery system employed by the Canadian Government."

The delivery system referred to was specially designed for and adapted to be used in connection with small plants with a maximum capacity of 3,000 to 3,500 tons per season, in the operation of which the peat is dug entirely by manual labor, and it works satisfactorily in connection with such a plant, as the existence of hundreds of successful installations in Europe amply proves. To attempt to link up such a system, however, with a mechanical excavator of enormously greater capacity appears to have been due to an engineering oversight.

PATENTS RELATING TO PEAT ISSUED BY THE CANADIAN PATENT OFFICE.

	Number.	Date.
Peat, Process for drying raw. Brune & Horst	137963	Jan. 23, 1912
Peat, Molding and Spreading Machine. A. Anrep	141700	July 16, 1912
Peat by pressure. Separation of water and solid substances of carbonized, Keeble, H. & A. C.	142519	Aug. 27, 1912
Peat, Apparatus for treating. A. Anrep	142632	Sep. 3, 1912

Patent No. 137963 (Jan. 23, 1912.)

Heinrich Brune and Heinrich Horst of Frankfort on the Maine, Germany. (Assigned to Eugen Abresch.)

Process for drying raw peat in presses with use of porous admixtures to make the raw peat pervious.

The invention consists in adding to the raw peat to be pressed, compressed peat which has been dried hard, which can be withdrawn continuously from the finished product. It is claimed that this admixture gives to the raw peat the property of giving up in the press the whole of the water it contains. It is pointed out that peat dust is not applicable as admixture for the purposes of the invention because it is not sufficiently dense, and the mixing and pressing must be performed very quickly in order to prevent the peat dust from falling out of the raw peat.

The commercial failures arising from attempts to utilize for this purpose ashes, small coals, sawdust, chaff, coke made from coal and peat, comminuted straw and the like are cited. In particular the failure of peat coke as an admixture is mentioned, and said to be due to the fact that the ignition temperature of the coke is higher than the combustion temperature of the peat, so that the peat burns without ignition of the coke.

Claims:—

1. A process for drying raw peat, which process consists in mixing with the raw peat hard dried compressed peat, and pressing the mixture.

2. A process for drying raw peat, which process consists in mixing with the raw peat hard dried compressed peat and subjecting the mixture to a continuously and gradually increasing pressure.

Patent No. 141700 (Sept. 3, 1912.)

A. Anrep of Helsingborg, Sweden.

Peat Molding and Spreading Machine.

The machine comprises a filling frame resting in front on one or more rollers and at the rear on the moulding frame. The latter is connected with the filling frame by means of a pivot shaft or hinge adapted to swing upward, and to trail on the drying ground when the machine is dragged forward.

The mould board which has for its object to smooth and mould the peat cake without dragging it or tearing it into pieces, is horizontal or nearly so. At the rear end of the machine are movable dividing tongues or fingers on which are cutting knives intended to divide the peat cake into strips. The rollers in front serve to compress and level the drying ground in advance of the moulding apparatus, and also furnish centres of rotation when the apparatus is turned. A horizontal screw in front of the moulding frame, which is rotated by the shaft of the rollers, divides the peat and gives it the desired thickness before it arrives under the cover of the moulding frame, which by means of its horizontal cover exerts a vertical pressure on the peat mass, producing a good and uniform moulding action.

The rollers are loose on the shaft with the exception of the middle one which furnishes the power for driving the screw, and when the apparatus is turned the outer rollers rotate freely on their shaft.

Owing to the fact that the moulding frame is adapted to swing vertically round its pivot shaft, the frame receives a part of the weight of the framework and is adapted to follow the irregularities of the drying field.

Claims:—

1. In a peat moulding and spreading machine of the character described, a framework adapted to receive the previously prepared peat, a moulding frame mounted in the rear thereof and adapted to exert a vertical downward pressure on the peat passing thereunder, and means for spreading the prepared peat to a uniform thickness prior to passage beneath the moulding frame.

2. In a peat moulding and spreading machine of the character described, a frame work to receive prepared peat, a moulding device mounted in the rear of said frame and adapted to exert a vertical downward pressure on the peat passing thereunder, and a spreading screw mounted in said frame in advance of said moulding device.

3. In a peat moulding and spreading machine of the character described, a frame work to receive prepared peat, a moulding device mounted in the rear of said frame and adapted to exert a vertical downward pressure on the peat passing thereunder, a spreading screw mounted in said frame in advance of said moulding device, and rollers carried by the forward part of said frame and adapted to level the irregularities of the field.

4. In a peat moulding and spreading machine of the character described, a framework to receive prepared peat, a moulding device mounted in the rear of said frame and adapted to exert a vertical downward pressure on the peat passing thereunder, a spreading screw mounted in said frame in advance of said moulding device, rollers carried by the forward part of said frame and adapted to level the irregularities of the field, and means for driving said screw from said rollers.

Patent No. 142519 (Aug. 27, 1912.)

Horace Keeble and Arthur Cecil Keeble, The White House, Wereham, England.

Hitherto satisfactory separation of wet carbonized peat and its associated water, and conversion of the peat residue into a compressed solid with a minimum of liability to disintegration under conditions to which it is likely to be subjected have been difficult of accomplishment.

Processes necessitating heat for evaporating the main portion of the water are expensive, whilst, by reason of the finely divided and greasy condition of the carbon, attempts to separate the combined peat and water by applying pressure have been unsatisfactory, since, in the case, for instance, of perforated plates the material passes away with the water, whilst if fibrous material, as flannel, be employed, clogging results.

It is claimed that both these disadvantages of separation by pressure can be overcome by interposing between the material and the water exit several layers of wire gauze maintained in close contact with one another and held firmly between smooth metal or other hard surfaces, so that escape of expressed water must be through portion of the gauze layers gripped between such surfaces. Usually, it is stated, two layers of gauze suffice, suitable degrees of fineness being between the limits of say 90 holes per square inch and 30 holes per square inch. The different layers of gauze may be of the same or different mesh.

In the four accompanying figures various forms of apparatus suitable for carrying out the invention are set forth, and numerous details in the same are covered with twenty-three claims. Claim 1, which broadly covers the invention, is as follows:—

1. In apparatus for the separation of water and solid substances, a press mould formed with water exit openings, a press piston arranged to work within said mould and the water exit openings thereof, and bodies with smooth hard surfaces between which said layers of gauze are firmly held.

Patent No. 142632 (Sept. 3, 1912.)

A. Anrep of Helsingborg, Sweden.

Apparatus for Treating Peat.

Claim:—

"A machine for treating peat comprising, a cylindrical body having a receiving chamber provided with a feed inlet in its top, and having a delivery through said chamber and body, means for rotating said shaft, coarse cutting knives on said shaft and arranged directly beneath said feed inlet opening, a plurality of stationary knives fixed to the interior of said receiving chamber and co-operating with said coarse cutting knives, a set of stationary knives extending diametrically across the interior of said body at the point where the receiving chamber joins the body, a set of fine cutting knives secured to the aforesaid shaft directly in the rear of the last mentioned stationary knives and co-operating therewith, and a plurality of kneading arms arranged radially about said shaft from a point adjacent said fine cutting knives to the opposite end of the shaft."

Peat is treated in the machine in such manner that the roots and fibres are cut, and it is thereafter subjected to an intense cutting between movable and stationary knives and afterwards pressed through a kneading and mixing apparatus, whereby the final product acquires uniform plastic properties, so that uniform moulding is possible while the contractibility of the peat during the drying operation is considerably increased, and a heavy and hard product obtained, which is not very absorbent of moisture.

The novelty of the invention resides in the correct and subsequent combinations of the various phases of the process in such a manner that they succeed each other immediately and without interruption.

COAL STATISTICS (1892-1911).

(1) IMPORTS OF COAL INTO CANADA.

Fiscal Year	Bituminous coal		Anthracite coal and Anthracite dust		Bituminous Coal dust	
	†Tons	Value $	†Tons	Value $	†Tons	Value $
1892	1,615,220	4,099,221	1,479,106	5,640,346	82,091	39,840
1893	1,603,154	3,967,764	1,500,550	6,355,285	109,585	44,474
1894	1,359,509	3,315,094	1,530,522	6,354,040	117,573	49,510
1895	1,444,928	3,321,387	1,404,342	5,350,627	181,318	52,221
1896	1,538,489	3,299,025	1,574,355	5,667,096	210,386	53,742
1897	1,543,476	3,254,217	1,457,295	5,695,168	225,562	59,609
1898	1,684,024	3,179,595	1,460,701	5,874,685	229,445	45,556
1899	2,171,358	3,691,946	1,745,460	6,490,509	276,547	44,717
1900	2,439,764	4,310,964	1,654,401	6,602,912	330,174	98,349
1901	2,516,392	4,956,025	1,933,283	7,923,950	414,432	275,559
1902	3,047,392	5,712,058	1,652,451	7,021,939	489,548	264,550
1903	3,511,412	7,776,717	1,456,713	7,028,664	550,883	420,317
1904	4,053,900	9,108,208	2,275,018	10,461,223	608,041	544,128
1905	4,176,274	8,002,896	2,604,137	12,093,371	650,261	343,456
1906	4,495,550	8,360,348	2,200,863	10,304,308	747,251	489,180
Calendar Year	Bituminous round and run of mine				Bituminous slack such as will pass through ¾ in. screen	
1907	6,370,152	13,232,445	3,141,873	14,506,129	1,139,256	1,121,949
1908	6,025,574	12,516,748	3,160,110	14,478,536	1,111,811	1,355,677
1909	5,625,063	11,455,818	3,017,844	13,906,152	1,230,017	1,469,889
1910	(a)5,966,466	11,919,341	(b)3,266,235	14,735,062	(c)1,365,281	1,795,598
1911	8,905,815	18,407,603	4,020,577	18,794,192	1,632,500	2,090,796

(a) Duty, 53c. per ton. (b) Duty free. (c) Duty, 14c. per ton.

†Ton of 2000 lbs.

(2) CONSUMPTION OF COAL IN CANADA.

Calendar Year	Canadian Tons	Imported Tons	Total Tons	Percentage Canadian	Percentage Imported	Consumption per capita Tons
1892	2,464,012	3,082,429	5,546,441	44.4	55.6	1.133
1893	2,823,187	3,110,462	5,933,649	47.6	52.4	1.198
1894	2,743,376	2,917,818	5,661,194	48.5	51.5	1.130
1895	2,467,109	2,933,752	5,400,861	45.7	54.3	1.066
1896	2,639,055	3,206,456	5,845,511	45.1	54.9	1.140
1897	2,799,977	3,124,485	5,924,462	47.3	52.7	1.143
1898	3,023,079	3,274,981	6,298,060	48.0	52.0	1.200
1899	3,631,882	4,092,361	7,724,243	47.0	53.0	1.454
1900	3,989,542	4,361,563	8,351,105	47.8	52.2	1.561
1901	4,912,664	4,810,213	9,722,877	50.5	49.5	1.797†
1902	5,376,413	5,165,938	10,542,351	51.0	49.0	1.895
1903	6,005,735	5,491,870	11,507,605	52.2	47.8	2.018
1904	6,697,183	6,909,651	13,606,834	49.2	50.8	2.325
1905	7,032,661	7,343,880	14,376,541	48.9	51.1	2.391
1906	7,927,560	7,398,906	15,326,466	51.7	48.3	2.477
1907	8,617,352	10,549,503	19,166,855	45.0	55.0	3.034
1908	9,156,478	10,195,424	19,351,902	47.3	52.7	2.976
1909	8,913,376	9,711,826	18,625,202	47.9	52.1	2.779
1910	10,532,103	10,438,123	20,970,226	50.2	49.8	3.031
1911	9,822,749	14,424,949	24,247,698	40.5	59.5	3.388

†Consumption per capita since 1900, based on late census returns.

(3) PRODUCTION OF COAL BY PROVINCES.

	Nova Scotia (tons)	New Brunswick (tons)	Saskatchewan (tons)	Alberta (tons)	British Columbia (tons)	Yukon (tons)
1892	2,159,389	6,768	5,100	178,970	937,218	
1893	2,444,924	6,200	8,325	230,070	1,093,980	
1894	2,527,982	6,469	15,051	184,940	1,112,628	
1895	2,225,145	9,500	15,769	169,885	1,058,045	
1896	2,508,570	7,500	16,706	209,162	1,003,769	
1897	2,403,554	6,000	25,000	242,163	1,019,390	
1898	2,563,180	6,160	25,000	315,088	1,263,680	
1899	3,148,822	10,528	25,000	309,600	1,431,101	
1900	3,623,536	10,000	40,500	311,450	1,791,833	
1901	4,158,068	17,630	45,000	340,275	1,919,488	5,864
1902	5,161,316	18,795	70,400	402,819	1,808,441	4,910
1903	5,653,338	16,000	116,703	495,893	1,676,581	1,849
1904	5,596,241	9,112	124,885	661,732	1,862,625	
1905	5,646,583	29,400	107,596	931,917	1,945,452	7,000
1906	6,220,505	34,076	118,398	1,246,360	2,146,262	7,000
1907	6,354,133	34,584	151,232	1,591,579	2,364,898	15,000
1908	6,652,539	60,000	150,556	1,685,661	2,333,708	3,847
1909	5,652,089	49,029	192,125	1,994,741	2,606,127	7,364
1910	6,431,142	55,455	181,156	2,894,469	3,330,745	16,185

CANADA'S SUPPLY OF COAL.

Central Canada is constantly within measurable distance of a coal famine; nor are the conditions which may precipitate such a famine in any considerable degree within the country's control. This is due to the fact that all eastern and central Canada is dependent on the Pennsylvania fields for their supply of anthracite coal. In view of the threatened strikes of the Pennsylvania miners, the situation becomes of unusually grave importance to Canadians. It is only when such strikes occur that the public actually realizes how dependent it is upon supplies of United States coal. Again, very few seem to realize the fact that supplies of United States coal, both anthracite and bituminous, may be entirely denied us at any time. Mr. George Otis Smith, of the United States Geological Survey, says: "Let us keep our coal at home and with it manufacture whatever the world needs." Should this happen, could we say that we are prepared to get along without it?

DEPENDENCE ON UNITED STATES FOR ANTHRACITE.

According to a recent estimate, anthracite coal in the United States will be exhausted in less than two-hundred years. Long before that time the cost will increase, and the United States government will see to it that the coal is not exported, but kept at home for its own needs. Let us see to what extent United States coal is sold in Canada. Enquiries sent out by the Commission of Conservation show that the following provinces are supplied with anthracite coal from the United States:—

PROVINCE-COST TO CONSUMER

Nova Scotia	$ 6.50	to	$ 7.00
Cape Breton	6.50	to	8.00
Prince Edward Island	6.00	to	6.50
New Brunswick	7.00	to	8.00
Ontario (east of Port Arthur)	6.00	to	7.75
Ontario (west of Port Arthur)	8.00	to	11.00
Manitoba	11.00	to	12.50
Saskatchewan	12.50	to	15.00

OUR BITUMINOUS COAL SUPPLY.

With regard to bituminous coal, Ontario, west of Cornwall, is supplied entirely from the United States. Owing to the low freight rate, Nova Scotia cannot compete with United States coal west of Cornwall. The bituminous coal consumed in Manitoba is almost entirely from the United States, although coal mined in the Crow's Nest and Lethbridge districts finds a ready market in Western Manitoba.

From the above it can be seen that one of the most important questions we have in Canada, at least in the Province of Ontario and the Prairie Provinces, is the question of fuel. The fuel for the Prairie Provinces will necessarily be supplied in the form of coal and briquettes from mines in British Columbia, Alberta, and Saskatchewan. This, however, does not apply to the Province of Ontario, and for economic reasons stated before, Nova Scotia coal cannot find a market in Ontario.—"The Power House," May, 1912.

AMERICAN PEAT SOCIETY CONVENTION.

The sixth annual meeting of the American Peat Society was held in New York on September 5th, 6th and 7th, in connection with the Eighth International Congress of Applied Chemistry.

Dr. Joseph A. Holmes, Director of the Bureau of Mines, Washington, D.C., and President of the Society, presided. His opening address was full of interest, and from its tone it may safely be predicted that the peat industry will have sympathetic treatment at his hands.

Dr. J. Hyde Pratt, State Geologist of North Carolina, in an excellent paper reviewed the work being carried on in that State in reclamation of swamps, whereby eventually enormous areas of swamp land will be rendered suitable for agriculture or made available for industrial purposes. Upon motion by Dr. Pratt, subsequent to discussion of his paper, a resolution was unanimously passed urging upon Congress to set aside an appropriation for the purpose of locating, defining, and accurately mapping the swamp lands of the Eastern States as a preliminary to inauguration of concerted action for reclamation and improvement of same.

Professor W. R. Beattie, of the United States Department of Agriculture, made an able presentation of the great agricultural value of the peat bogs of the United States. A very interesting and practical paper on the best methods and machinery for gathering peat and preparing it for fuel on a large commercial scale was read by Dr. T. Arthur Mighill, of Boston, Mass. Dr. Mighill's paper led to a discussion of working methods in which many of the members present joined.

Among the most valuable features of the meeting was a very lucid and thorough description by Mr. B. F. Haanel, Chief Engineer of the Dominion Government Fuel Testing Station at Ottawa, of the work done by the Mines Branch in connection with the development of the peat industry in Canada. This included an account of the operations of the Government's demonstration plant at Alfred, Ontario, where air-dried peat fuel has been successfully manufactured with an Anrep plant for the past two years. He also detailed fully the experiments carried on at the Fuel Testing Station during the same period in utilization of peat fuel for the production of power by means of a gas-producer plant.

Mr. Ernest V. Moore, of Peterborough, Ontario, described a new plant for manufacture of peat fuel on a large commercial scale which has been erected during the past summer on the Canadian Government peat bog at Alfred, Ontario. This plant includes a new and improved mechanical excavator of

large capacity designed by the late Aleph Anrep, and other novel features which promise to be of very great practical value. Although it was late in the season when the plant was fully installed, it is confidently expected that next year's operations will show highly satisfactory commercial results.

A very comprehensive display of the by-products of peat recoverable by distillation, was shown by Mr. James E. Smith, of Clinton, Iowa.

Professor Chas. A. Davis, Fuel Technologist of the United States Bureau of Mines, and Editor-in-Chief of the Journal of the American Peat Society, reviewed the progress of the peat industry in 1911, and initiated a discussion of ways and means of improving the Journal of the Society, in which many members took part. The Journal has made for itself a recognized position with the scientific and technical press, and is deserving of a greater measure of financial support.

All papers, discussions, and transactions will be fully reported in the columns of the Journal of the American Peat Society.

At the close of the proceedings the members visited the plant at Alphano, N. J., where they inspected a large peat fertilizer filler plant in operation. The Alphano plant manufactures from 100 to 150 tons of finished product per day of 24 hours, and has many valuable practical features in the handling of peat. Several hundred acres of bog lands planted with celery and onions gave the visitors a splendid object lesson on the successful combination of agricultural utilization of peat bogs with their industrial development.

The place of holding the next annual meeting was left to be decided by the executive committee, three cities being named, viz.: Chicago, Ill., St. Augustine, Fla., and Montreal, Canada.

Arrangements were perfected for incorporation of the Society.

The following officers were elected for the ensuing year:—

President: John N. Hoff, 17 Battery Place, New York.

1st Vice-President: Dr. T. Arthur Mighill, 15 Exchange Street, Boston, Mass.

2nd Vice-President: Carl Kleinstueck, Kalamazoo, Michigan.

Secretary-Treasurer: Julius Bordollo, Kingsbridge, New York City.

Executive Committee: G. Herbert Condict, 922 Central Ave., Plainfield, N. J.; Dr. Chas. F. McKenna, 50 Church Street, New York; Dr. J. McWilliam, London, Ont., Canada; Dr. Herbert Philipp, Perth Amboy, N. J.; Robert Ransom, St. Augustine, Florida.

PEAT PRODUCTION.

In European countries, where labor is cheap, peat fuel has been produced for many years. In Canada, where labor is expensive, development of the peat industry has been retarded on account of the cost of production.

The history of the many attempts made on the continent of America to produce peat fuel indicates "failure after failure." But persistent effort was bound ultimately to meet with its reward; experience taught that hand labor must be replaced by machinery and that natural instead of artificial methods of drying were preferable. The result is that to-day peat fuel is produced commercially, and although improvements must and will be made, still the methods now employed give a product that will compare favorably with the best coals on the market, and if taken on a B. T. U. test might be found to beat some of them.

The complaint that peat fuel is too bulky for shipment no longer holds good, as from twenty-five to thirty tons can easily be loaded into an ordinary freight car. For the railroad companies the freighting of peat is more satisfactory than other fuels, as being cleanly to handle. Any kind of cars can be used and, being available for return freight, are not hauled back empty as in the case of coal cars. The fuel stands handling well, consequently open cars can be used for transportation.—The Canadian Mining Journal.

BY-PRODUCT GAS-PRODUCERS.

Most American inventors of gas-producers have endeavored to produce tar-free gas from bituminous coal. Some have been quite successful and others have produced gas heavily charged with lampblack, which has proved very troublesome around gas-producers and engines.

The United States Steel Corporation is said to be producing coke at one of its new plants for almost nothing, the gas and by-products practically paying for the coal and the cost of the coking process.

A large Mond gas-producer plant has been in operation at Dudley Port, near Birmingham, England, for several years, from which the by-products, tar and ammonium sulphate, are recovered and sold. The gas is distributed through mains over a considerable area and practically no trouble has been experienced with tar in the distributing system, doubtless due to the careful and thorough washing given the gas after it leaves the producer. It has always been objected that such a process could not succeed in America, owing to the difficulty of disposing of the by-products. The American farmer is as progressive as any in the world, and when he learns the advantages of

ammonium sulphate as a fertilizer, the demand for this material will increase rapidly. The plant of the Steel Corporation already referred to seems to have no difficulty selling its by-products.

Tar, usually considered a waste, may prove one of the most valuable of all by-products. The success attained in Europe in using tar-oils and even moderately thick tar as a fuel for Diesel engines opens up a wide field for this waste product.

European engineers have shown what can be done in developing new processes and utilizing new equipment, as, for instance, the producers and Diesel engines already mentioned. It is now time for an American engineer to design and build a producer-gas central station for one of our large cities. The by-products from the bituminous coal could be saved and the ammonium sulphate marketed. The tar would be treated and such portions saved as can be used for fuel for Diesel engines. These engines could be located in substations and used only to carry the peak loads. The residue of heavy tar substances might be put into stills and subjected to a cracking process until all that remains is a coke which could be returned to the producer. Such a process would make available many cheap grades of bituminous coal and would entirely stop the smoke nuisance. While many difficulties would have to be overcome, none are beyond our present engineering ability. Such a plant would probably occupy much larger floor space than a corresponding steam plant, but it could be located outside the city proper and the gas piped to large holders near the power plants. These plants could be located to minimize the distribution losses. By providing Diesel engines for peak loads, the central producer-plant could operate steadily at nearly one hundred per cent. load factor. This economy of operation, with the high thermal efficiency of the gas engine itself, should make such a station highly profitable, even though the first costs may exceed those of a steam-turbine power plant of equal capacity. The problems involved in such an undertaking are exceedingly intricate, but the possibilities warrant very careful consideration by our engineers.

THE PRODUCER-GAS ENGINE AS A FACTOR IN CONSERVATION.

The finding of new or broader uses for a heretofore useless or little-used material as cheaper substitute for some other substance constitutes the ideal conservation. At the present time the efforts of conservationists are directed to means for prolonging the life of our fuel supplies. Statisticians have already placed a short time limit for the life of the Pennsylvania anthracite coal field, and a longer one for the supplies of bituminous coals. The most effective way of conserving these fuels is not by forbidding their use, but by reducing the losses of energy in the generation of power, and by utilizing cheaper substitutes for them in sections where the latter are available.

The gas engine operated by producer gas furnishes an efficient means for conserving fuels by making available for power generation such low-grade fuels as peat, lignite, and low-grade coals, waste gases and even corn-stalks; in fact, almost any low-grade combustibles or wastes, which are practically valueless for steaming purposes.

Investigations have been carried on by the United States Government to determine the value of producer-gas-operated gas engine as a fuel conserver. The results of these investigations have been published by the Bureau of Mines, as Technical Paper No. 9, "The Status of the Gas-Producer and of the Internal Combustion Engine in the Utilization of Fuels."

According to that paper the tests made showed that coals consumed in producer-gas plants develop about two and one-half times the power that the same coals would develop in the ordinary steam-boiler plant, and that certain low-grade lignites will develop, when converted into producer-gas as much power as some of the high-grade bituminous coals when burned under a steam boiler. This is equivalent to transforming a low-grade fuel into a high-grade fuel, with other important advantages added.

It is stated that the yearly saving made by the United States Steel Corporation in generating power from blast furnace gases by means of gas engines, amounts to approximately 1,000,000 tons of coal.

It is further pointed out that, as producer-gas is smokeless, it will become an important factor in eliminating the smoke nuisance, which follows the use of soft coals under boilers.—"Mining and Engineering World," August 17, 1912.

PEAT IN NEW ONTARIO.

"As regards peat, it abounds everywhere, even on the height of land, and, while it detracts greatly from the value of the country from an agricultural point of view, burying, as it has done, millions of acres of fertile soil which might otherwise have been easily reclaimed and cultivated, I am, notwithstanding, still firmly of opinion that this inexhaustible supply of fuel will, at no distant day, be turned to account, and prove of inestimable value to the people of Canada, and more particularly of our own province."

"I stated in my report last year that I believed that not less than 10,000 square miles of territory claimed by Ontario, north of the Height of Land, was overlaid by beds of peat. I am persuaded that the area will eventually be found greatly to exceed that estimate.

(Extract from Report of E. B. Borron (1882) on that Part of the Basin of Hudson's Bay Belonging to the Province of Ontario.)

ELECTRICITY FROM PEAT.

European engineers are engaged in the investigation of methods of utilizing peat as fuel in electric stations. Southern Bavaria, for instance, has vast fields which would serve to run electric plants of large size and this would give a great reserve of power. The peat bogs lie mainly in the region of the Danube, and are estimated to cover an area of 500 square miles. Supposing the peat layer to be only three feet in thickness and the cubic foot of peat to afford but three pounds of fuel, this will mean a supply of fifty million tons. The fuel can be burned under boilers, or it can be used in special producers to secure a supply of gas for industrial purposes.

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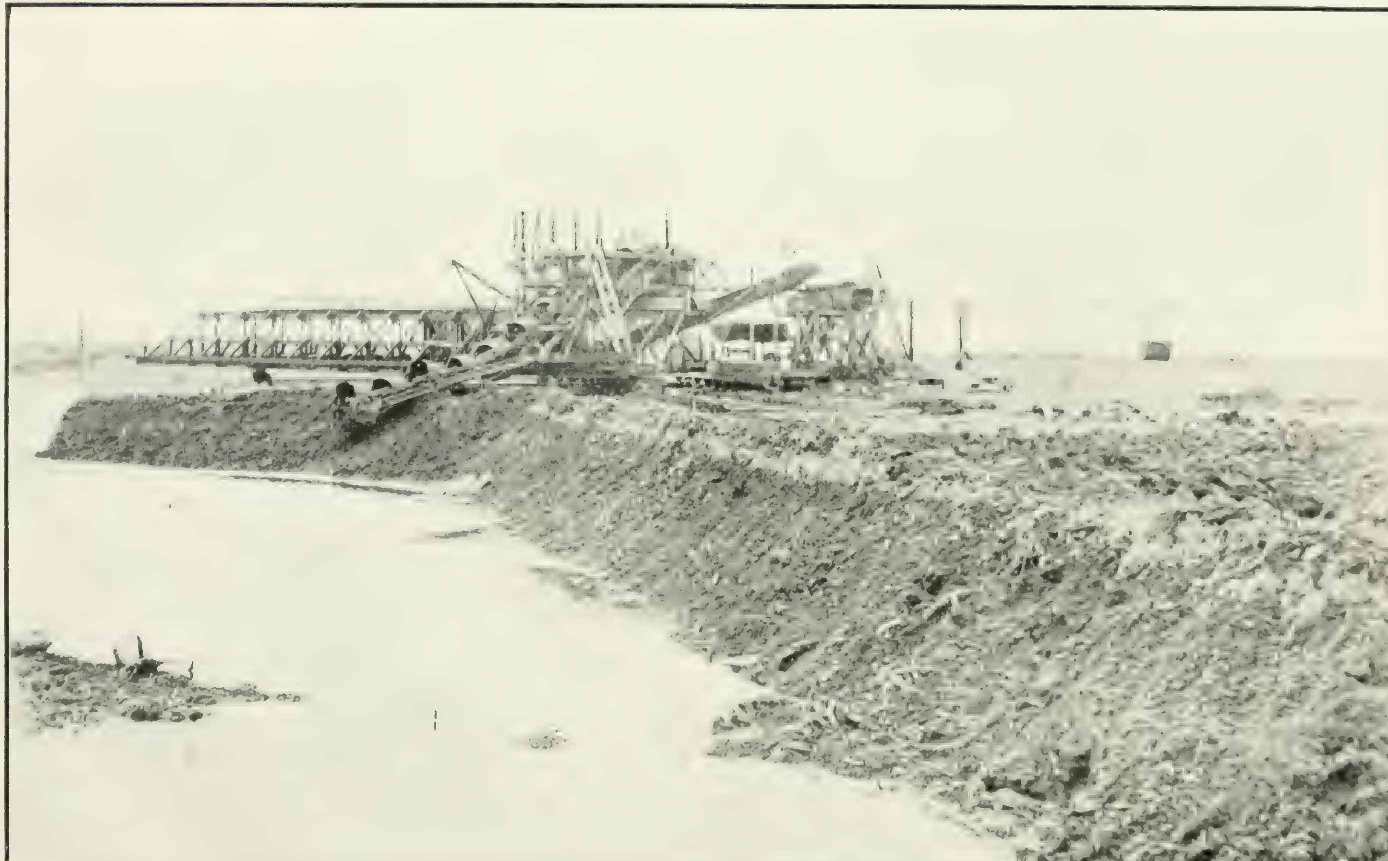

Panoramic view of Alfred Peat Bog and plant, showing the "Anrep" excavating machine in operation, 1912

Journal of the
Canadian Peat Society

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THE NEW ALFRED (ONT.) PEAT FUEL PLANT.

(From a paper written for the Sixth Annual Meeting of the American Peat Society, by Ernest V. Moore, B.Sc., Mi.E., Peterboro, Ont.)

The demonstration plant erected at Alfred by the Department of Mines having been successfully operated during the seasons of 1910 and 1911, and the purpose of its installation accomplished, arrangements were made in the latter year by which the operations will be carried on in future by private capital. The portion of Mr. Moore's article following deals with the progress of work subsequent to such arrangement.—Ed.)

In the fall of 1911 negotiations were completed between the Department of Mines, and Mr. J. M. Shuttleworth, of Brantford, Ont., to continue the work at Alfred, Mr. Shuttleworth undertaking to provide a plant conforming with the general plans suggested by the Director of Mines.

Under a separate agreement with Mr. Shuttleworth, the writer undertook to design, build, install and operate this plant, and a contract was made for its delivery about the first of April last. Complete delivery was not made until the end of June. Certain alterations found necessary after it was first tried out, caused further delay, and only about the end of the season was the plant declared in satisfactory running order. About 100 tons of fuel were made under conditions that demonstrated beyond a doubt that a better quality of fuel, in uniformity of dryness, in appearance, and in the quality of the blocks themselves, than that made by the Department, was being turned out, and the cost of manufacture was but a fraction of that experienced in the earlier operations. This new plant now stands on the bog at Alfred complete in so far as the operation of making the fuel is concerned, and ready for a full season's operation in 1913, when it is expected that work will be energetically carried on.

As now installed this plant consists of five distinct parts which for clearness' sake will be taken up separately. They are the Power House, the Excavator and Macerator combined, an overhead Cableway, the Spreader, and the Harvesting Equipment.

The Power House is built on solid ground on the shore of the bog about a quarter of a mile from the drying field. The equipment consists of an ordinary horizontal, return tubular boiler, about 80 or 90 horsepower, encased in brick according to standard practice as to size of grate, distance from boiler shell, etc. In this connection it is interesting to note that this boiler was fired entirely with peat and that the fuel proved in every way satisfactory. With the full plant in operation, the switchboard showed a maximum of 15 amperes at 2,200 volts, or nearly 60 H.P., and at no time was there over two and one-half tons of fuel consumed in 10 hours. This fuel would average about 20 per cent. water content. A 13x30-inch Corliss engine running at 90 R.P.M., is used to turn over a 100 KVA. 3-phase, 60-cycle, 2,200-volt alternator with its exciter. These are connected up with a switchboard fully equipped with measuring instruments, and from this switchboard the power line leads to the working field on the bog. The current is carried the whole length of the drying ground, parallel to the line along which the excavator moves, and a short distance away from it.

The Excavator and Inside Tower, taken from front side. Excavator moves towards spectator. The transformer house on the excavator car is visible, and the traverser is seen at the left-hand end of the oblique bridgework; also, the trough conveying the excavated peat to the macerator.

The Excavator and Macerator were designed and patented by the late Mr. A. Anrep, of Helsingborg, Sweden, and were built entirely from plans supplied by him, the making of which constituted his last active work with peat. Like the Anrep device installed by the Government, this combination of machinery rests on a primary car, supported by three sets of wheels, on three parallel tracks. The rails forming these tracks are in short sections, and the ties are arranged to be conveniently moved ahead from time to time as the machine progresses. On the rear side of this car is superimposed a horizontal structural steel bridgework supporting two parallel rails, at an angle of 45 degrees with the direction of the motion of the car, the reason for which will be explained later. This primary car

also supports a transformer house in which is situated step-down transformers to bring the 2,200-volt current down to 550 volts, at which pressure it is distributed through a number of oil immersed starters, to a 30 H.P. induction motor which drives the cableway and to the trolley wires of a 5 H.P. motor on the spreader. The last two motors are connected up with the starters with flexible conductors to permit of a relative movement between the excavator-macerator and the end tower of the cableway.

Travelling on the oblique rails already mentioned is a light steel framework which automatically moves from one side to the other the full width of the excavation, and in this is supported the excavating element. This traverser, driven by its own motor, is practically an independent device traveling slowly backward and forward on the oblique rails, excavating a layer from the working face each journey. The excavating element is a simple and strong bucket and chain elevator, the top half of which works in this framework while the lower half is supported by an arm the outer depth of which can be raised or lowered to regulate the depth of the excavation. When digging 9 feet deep this arm points downward at an angle of about 45 degress, and owing to the oblique direction of travel of the traverser, not only the excavated face, but also the side standing wall, are left on practically a natural slope. This is a very important feature of this excavator, as it permits a second cut being made without fear of a cave in.

In operation, the primary car remains stationary, while the traverser makes one journey from one side to the other. The whole device is then moved ahead about eight inches and the traverser makes its return journey, and so on, continuously. The main car is moved ahead by power, six of its supporting wheels being drive wheels.

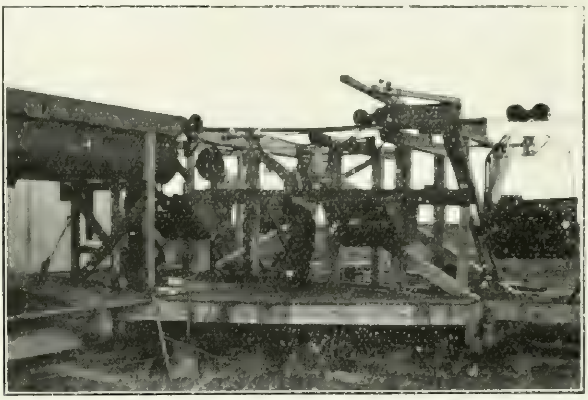
The excavator dumps into a trough supported on the front side of the bridgework, running the full length of its travel and from this trough the peat is delivered into the macerator which is also rigidly attached to the primary car. The current is brought from the power line by three flexible, heavily insulated conductors which are plugged in on the main line each morning before the current is turned on at the power house. These conductors are sufficiently long for a day's operations.

The excavator has lived up to expectations. It cuts a clean trench up to 10 feet deep, and about 29 feet wide. Owing to the number of large roots in the Alfred bog, one attendant is necessary in the working trench to pull these out of the way of the excavating buckets and no difficulty has been experienced in working practically continuously. Should a short delay occur, however, the capacity of the excavator is so much greater than that of the rest of the plant, that no delay is occasioned in the general operations.

The Macerator is the largest size of Anrep Macerator yet made. It will deliver raw peat for between 6 and 7 tons of fuel per hour, with a 30 H.P. motor and a larger amount with more power.

From the Macerator the peat travels or is propelled by a 16-inch spiral conveyor to a loading hopper situated on the inside end tower of the cableway.

The Cableway, provided to take macerated peat to the Spreader, consists essentially of two towers placed opposite each other about 900 feet apart, and so supported on wheels, resting on rails held in place by ties of peculiar construction, that they can move only in a direction at right angles to a line drawn from one tower to the other, distance between the towers remaining the same. The towers are connected by two parallel cables in the same horizontal plane strung from anchorage on them. At either end means are provided to put any desired strain on the cables, and on each tower, connecting the ends of the cables, are rigid, semi-circular tracks, so attached to the cables that a continuous and endless single track is obtained in the form of a horizontal loop, about 900 feet long, and 9 feet wide, the whole being about eight and one-half feet above the bog surface.

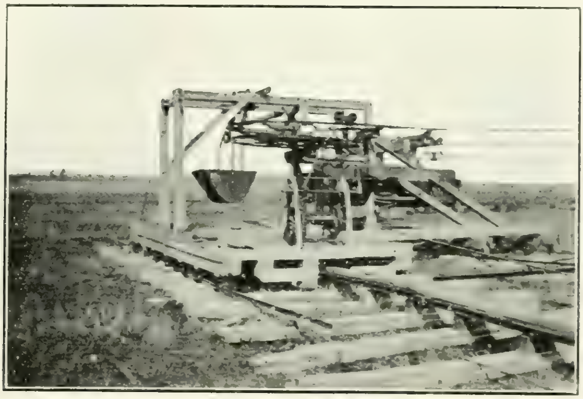


The Inside Tower, showing Loading Hopper and Buckets.

Intermediate between the end towers are light wooden supports spaced about every 75 feet. These also are on wheels that permit their movement only in a direction parallel to that of the end towers. They support the cable by special cable saddles as a clothes line pole supports a clothes lines, thus keeping the cables parallel, and their proper distance from the ground.

Twenty-four steel buckets of 10 cubic feet capacity each are provided. They are slung in a bale which permits them to be dumped by loosening a catch. The buckets are supported from the cable track by a two-wheeled truck to which the bale is fastened with a flexible joint. On the bale of the buckets is fixed a clutch to engage a haulage cable by means of which the buckets are given their desired motion. The haulage cable is endless and receives its motion from a series of drums and pulleys situated on the inside tower, i.e., the one nearest the excavator. On this tower is fixed the 10 H.P. motor driving the cableway. This cable passes out parallel to and below the track cable used to take up the loaded buckets,

passes around a large cable sheave on the outside cableway tower which supports and directs it so that it still keeps directly below the semi-circular track, and, returns parallel to and underneath the track cable on which the emptied buckets return to the inside tower again. This cable is supported in the clutches on the bales of the buckets, and these are about 75 feet apart when running so that it is not possible for two loaded buckets to get between any two consecutive cable supports at the same time. The clutches are designed so that they automatically pick up and engage this haulage cable as they are pushed out, filled, from the loading hopper. When the bucket reaches the place where it is desired to dump, the

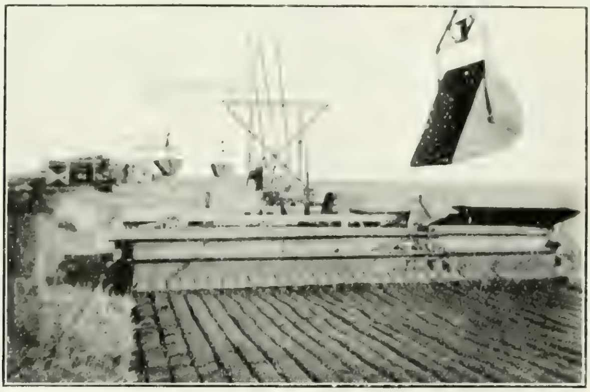


The Outside Tower, showing Ties and Rail in vertical plane which takes up the strain of the Cables.

clutch can conveniently be made to loosen so that the cable passes through the clutch without coming out of it, and, when the bucket is dumped, by a slight movement of the clutch lever, it again takes hold, passes the bucket around the semi-circular track on the outside tower without letting go the cable and continues to hold until the bucket arrives at the inside tower, where it receives its load again. Here the clutch automatically lets go the haulage cable, altogether, and permits it to pass over a guide pulley to the drums that give it motion. The bucket, in the meantime, continues its journey by gravity for a short distance until it is again convenient to the loading hopper.

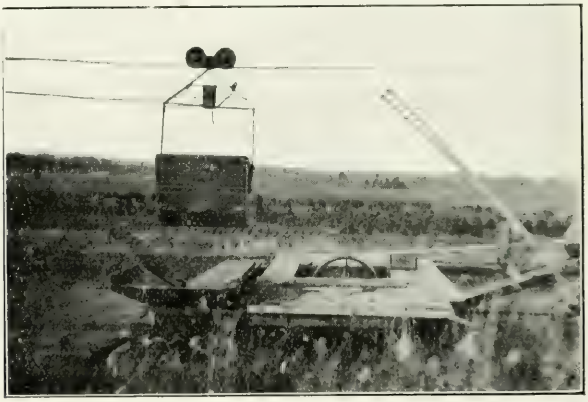
The ties supporting the end towers need some description. When the cableway is in operation a sufficient strain must be put on the track cables so that when the bucket and its load, about 1,000 pounds in all, is in the center of a span, there will not be over twenty-four inches deflection. This means a strain of many tons pulling these towers together. To make the towers sufficiently heavy to resist this pull would make them too cumbersome to move, conveniently, if at all. It has therefore been necessary to anchor the ties into the bog, so that they would resist this pull and at the same time, to attach the towers to the ties so that the towers might be moved when desired, and still maintain the strain on the cables. This has

been successfully done by bolting anchor plates to the under side of the ties and arranging a horizontal rail in a vertical plane, fastened to the upper side of the ties, against which vertical wheels fixed in the framework of the towers, rest, and transmit the pull on the cables to the anchor plates. By a simple arrangement the rails which take up the strain at each end tower are adjusted so that they are parallel, and the end towers kept a uniform distance apart as they move.



The Spreader starting up, showing section of Moulded Peat.
Cross-cutting Device not on.

On each end tower is fixed a hand winch which is used to draw in on a cable fixed to an anchorage some distance away, by which, when desired, even with the full strain on the main cables, the end towers may be moved ahead at right angles of course, to the direction of the cable strain, and parallel to the direction of



Side View of Spreader.

motion of the excavator-macerator. So great is the strain on the track cables that the intermediate supports move along also, practically maintaining the line of the cableway.

Finally, on the intermediate supports there is arranged a projecting arm which carries a three-wire trolley, from which power is obtained to operate the Spreader. These wires are parallel to the cable track carrying the loaded buckets and such distance away, that the Spreader, running underneath, is conveniently located to receive peat from the buckets.

In practice, after some minor difficulties had been overcome, this device was found to work easily and without a hitch. Patents covering it have been applied for.

The Spreader is again a device somewhat different to anything yet attempted in connection with the manufacture of machine peat fuel. It is used more or less of necessity, with a cableway or other elevated means of distributing the peat pulp, as the raw material could not conveniently be dumped into it from such dump cars as have usually been used. With this device an attempt is successfully made to place the moulded peat on the drying ground, absolutely uniform in thickness and section, and instead of dumping it with some force into the bog surface which of necessity makes it adhere and dry around small twigs, and pick up quantities of moss, etc., the moulded peat is gently laid on a surface on which all projections have been smoothed down. Again, the peat is moulded under a slight pressure and the section has rounded edges which adds materially to the quality of the finished product. The rounded corners makes less fine particles in the fuel after it has been handled two or three times in reaching the consumer's storage.

The Spreader is essentially a box into one end of which the peat pulp is dumped. It is uniformly distributed in this box by a special screw conveyor, and it is discharged again from the box which is trailed along on the ground, through thirty-four moulding spouts placed side by side in such position that the peat is forced out without any drop, onto the ground. This is accomplished by providing a separate screw to feed each spout and arrangement is made to regulate these screws so that the peat may be delivered from the spouts at any desired rate within a big range. The box is flexibly fastened to a caterpillar tractor, designed specially for this purpose, and which, at present, hauls it along at about eighty-four inches per minute. Power is obtained from the trolley wires above and the device is steered by a tiller, conveniently placed. An attachment is also provided, fastened to the rear of the Spreader, which cross-cuts the peat uniformly every eight to ten inches as desired.

It is found that the capacity of the Spreader varies directly as the speed of its driving motor. As it has been run, thirty-four strips, 4 inches by 4 inches are laid down side by side, making a strip almost exactly 12 feet wide. It moves 7 feet in a minute, so that 12x7x1-3, equals 28 cubic feet are spread per minute. If there were no delays this means the spreader has a capacity of 9 tons of 25 per cent. moisture fuel per hour.

The spreading box proper when loaded, with all its moving parts, weighs be-

tween three and four thousand pounds and as it is dragged over the drying field surface, all twigs, bits of moss, in fact, small inequalities in the bog surface itself, are smoothed down, and the peat gently laid on. The adjustment permitting the regulation of the rate at which the peat leaves the moulding spouts permits keeping this exactly the same as the movement of the spreading box, no matter how soft, or stiff, the pulp may be, and a very uniform section is obtained. The moulding dies are slightly rounded at the corners which moulds the peat this way also.

This device, as well as the others, has proven most satisfactory, producing a fuel evidently superior to that made from the same raw material by less complete methods of moulding. Like the cableway, patents have been applied for, to cover it.

In operation all these devices work harmoniously together. The drying area at Alfred, at present, is a rectangle three thousand feet long north and south, and a thousand feet wide, east and west. The Excavator, starting at the northeast corner, works along the eastern boundary in a southerly direction. It cuts out a prism 29 feet wide and the full depth of the peat. This is spread directly west of the Excavator, everything dug in a forward movement of this device of thirteen feet, nine inches, being spread in a strip twelve feet wide, running east and west. To do this the Cableway is located in a straight east and west direction, the inside tower being adjacent to the Excavator, and to the sixteen-inch spiral conveyor leading from the Macerator.

General View of Drying Field.

When the plant is in operation the Excavator moves ahead in eight-inch steps for a distance of thirteen feet, nine inches. The loading hopper on the cableway tower is this long, so that no matter where the Excavator is in this length of movement, it discharges into the loading hopper. From here it is dispatched, seven buckets every two minutes, along the cableway, from which it is dumped into the Spreader and laid on the bog surface, moulded. As soon as the Excavator has

reached the end of a thirteen foot, nine inch run, it is stopped, while the end towers, and with them the whole cableway, is moved ahead another thirteen feet, nine inches, by means of the winches provided for this purpose, and the Spreader is turned around ready for a return trip. This complete operation takes fifteen minutes of non-productive labor at present. This means about one minute lost in shifting for every ton of fuel made, but this might be cut down to one-half the amount if power were used to work the winches. In any case, it compares favorably with the smaller plants, where at best, three to three and one-half minutes are lost shifting tracks for every ton of fuel spread.

Apart from the men used at the power house, one man runs the Excavator without help except such as is given by the man removing roots out of the way. The ties and rails supporting this machine are kept moved ahead by a gang of three men who also, during the time in which one row is being spread, i.e. about two hours, move and put in place five ties for each end tower, and shift a light section of track thirteen feet, nine inches long, for each intermediate support to the track cables of the cableway. This they can do quite easily. The Cableway is operated, that is, the buckets are loaded and started away, by two attendants, and they are again dumped into the Spreader, and the Spreader looked after, by three more attendants. These men and the superintendent are all that are necessary for the complete operation of getting the peat moulded on the ground. The capacity of the plant, as run, is sixty tons of fuel, equal to three hundred and sixty tons of raw material, per ten hours, but, it has been operated at twenty-five per cent. greater output than this for shorter periods, and it is expected that the larger capacity can eventually be maintained under favorable conditions.

The whole plant, then, is a single combined unit nearly one thousand feet long, which starts at one end of the drying area and travels, in toto, straight down the drying area, moving thirteen feet, nine inches each step. The fuel is left moulded on the ground in parallel rows twelve feet wide, separated by a space of one foot, nine inches.

In a few days up to a week the moulded peat is stacked by hand into little piles. This is done by contract, and when the peat is dried down to 25 per cent. water content it is ready for the cars.

The harvesting arrangements at Alfred, the last district division into which the plant was divided, have not thus far been changed from those used by the Government. Peat is loaded into tram cars holding about a ton and three-quarters and taken along twenty-four inch gauge, Koppel, portable track to a loading platform where it is shoveled into box freight cars. Before any considerable quantity is shipped by the present operators, however, it is the intention to provide a light gasoline locomotive, more convenient dump cars, and a loading device to fill box cars to their capacity without having to shovel the fuel back. This will be taken up the first thing in the spring.

The plant will be operated this fall to provide fuel for next season's opera-

tions, when it is expected a full year's output will be obtained, as the plant is now complete and in order for continuous operation.

In conclusion, the success obtained with this plant, coupled with the successful and profitable operations of Peat Industries, Limited, of Montreal, Quebec, this year, makes possible the statement that peat fuel manufacture is now commercially established in Canada. True, the output this year was comparatively small, little more than last year, but a solid and practical foundation has been laid, and results obtained that are proving satisfactory to capital, and it is the firm conviction of the writer that in less than five years peat fuel will be extensively made and used in Canada, and more particularly in the Provinces of Ontario and Quebec.

DR. DE LAVAL.

The name of Dr. Carl Gustav Patrick de Laval of Stockholm, Sweden, who died on February 2nd, has for some years past been associated with the peat industry in that country. With Mr. Alf. Larson he had been recently engaged in experimental work on a wet-carbonizing process for the treatment of peat. Although no definite information as to results is yet available, the outcome of these experiments has been awaited with much interest. In the course of a discussion of Ekelund's peat powder which occurred at a Technological meeting held in Stockholm some months ago, Capt. Wallgren, Chief Engineer of the Swedish Government Peat Investigation, stated that Dr. de Laval's wet-carbonizing method would, in the future, be able to compete with peat powder.

Dr. de Laval, who was born in 1845 at Blosenberg, Sweden, graduated with high honours in engineering from Upsala University in 1872. Failing in a private venture, he became engineer to the Klosterverken Iron Works in 1875. During the late seventies and for some years aftrwards, his time and energy were devoted to the perfecting of the cream separators which have made his name known the world over. Following the many clever inventions he worked out in connection with centrifugal separators, came his highly ingenious form of steam turbine, and numerous other innovations in the application of mechanical principles, some of which have already been fertile in practical results. Dr. de Laval was interested in several important industrial concerns in Sweden. He was a member of the Swedish House of Representatives, and had been awarded many home and foreign orders and distinctions.

INVESTIGATION OF THE PEAT BOGS AND PEAT INDUSTRY OF CANADA, 1910, 1911.

By A. Anrep.

(Bulletin No. 8—Department of Mines, Mines Branch).

Part I. contains a report on the manufacture of Peat Fuel at the Government peat bog, Alfred, Ont., in 1910. Also table shewing analyses of peat samples collected in Ontario. (vide page 20 of this number).

Appliances for the manufacturing of peat fuel are reported upon, as follows:

The Lincoln excavating system at Farnham, Que.

Dr. Wielandt's combined excavating and spreading machine.

The Ekenberg wet-carbonizing process.

The Anrep excavating system.

Mechanical extraction of moisture from peat, by "Doering Consortium", Moscow, Russia.

PEAT PAPER.

Translation of an article on the microscopical investigation of peat paper samples, by Emil Haglund, from Svenska Mosskulturforeningens Tidskrift.

PEAT POWDER.

I.—Description and detailed particulars of the peat powder manufacturing plant at Back, Smaland, Sweden, by E. Nystrom, Jernkontorets Peat Engineer.

II.—A report on the manufacture of peat and peat powder at the Back Peat Bog by means of the Ekelund system, by Captain Ernest Wallgren, Chief Engineer, Swedish Government peat investigation.

III.—Note on the operation of the Munktell-Ekelund excavator on the Back peat bog.

IV.—Report of discussion on peat powder at Stockholm.

V.—Extracts from Swedish newspaper on peat powder manufacture.

Records of machine peat manufactured in Sweden, 1909, and in Denmark, 1910.

Part II. gives details of investigation of the Holland, Coney Island, Crozier, and Fort Francis peat bogs, Ontario, and of the Lac du Bonnet, Transmission, Corduroy, Boggy Creek, Rice Lake, Mud Lake, Litter and Julius peat bogs, Manitoba. (vide pp. 14-17 of this number).

Also of preliminary investigations of the Whitemouth, Plum, Netley, Clandeboye, Big Grass, Douglas, McCreary, Ochre River and Dauphin marshes in Manitoba.

(Copies of Bulletin 8 may be had by addressing application for same to Dr. Eugene Haanel, Director of Mines, Ottawa, Canada).

MANITOBA PEAT BOGS

(The following descriptions are condensed from those in Bulletin 8, Mines Branch, Department of Mines, Canada. "Investigation of the Peat Bogs and Peat Industry of Canada, 1910-11, by A. Anrep.")

LAC DU BONNET BOG.

Location:—60 miles east of Winnipeg, and 4 miles west of Lac du Bonnet.

Area:—249 acres.

Depth and cubical contents:—

180 acres less than 5 ft. deep, ave. 2½ ft., 701,809 cub. yds.

69 acres 5 to 10 ft. deep, 556,600 cub. yd.

Estimated production:—

59,371 tons peat fuel, with 25% moisture.

Analysis of peat, dry:—

Fixed Carbon	25.0 per cent.
Volatile matter	59.4 per cent.
Ash	15.6 per cent.
Nitrogen	1.4 per cent.
Phosphorus	0.069 per cent.
Carbon-hydrogen ratio	0.42 per cent.

Character of bog:—

Principally formed by sphagnum moss, except around the margin. In some parts there are stumps and trunks.

General Remarks:—

The peat in the middle part of the bog is fairly well humified, but is of poor quality, on account of the fact that bog had not a great depth and was poorly drained, so that the frost penetrated deep into the bog; hence the peat, in most places has lost its cohesive properties. The area of the middle part of the bog is comparatively small, and since it is cut up by ditches unsystematically laid out, it is not likely that it can be use for the manufacture of machine peat fuel. The peat in the rest of the area around the margin of the bog is very shallow, and heavily overgrown with alder and spruce, intermixed, in some parts, with balsam and young poplar.

By a systematic and thorough drainage of this bog a considerable amount of farming land would be recovered, which at present is practically valueless.

TRANSMISSION PEAT BOG.

Location:—18 miles from Point Dubois.

Area:—1375 acres.

Depth and cubical contents:—

Less than five feet,—10,648,888 cub. yds.

Estimated production:—

936,379 tons peat fuel with 25% moisture.

Analysis of peat, dry:

Fixed Carbon	24.2	per cent.
Volatile matter	56.8	per cent.
Ash	19.0	per cent.
Nitrogen	1.6	per cent.
Phosphorus	0.047	per cent.
Fuel ratio, fixed carbon—volatile matter	0.43	per cent.

Character:—

Mainly formed by sphagnum moss, intermixed with carex, aquatic plants, leaves, spruce cones and needles, sticks, roots and trunks.

General Remarks:—

This bog is comparatively shallow, and the peat poorly humified and of an inferior quality, hence it can be expected to yield only a very light fuel. It is not likely that this bog can be utilized and turned into machine peat by methods at present known.

CORDUROY PEAT BOG.

Location:—14 miles from Point Dubois.

Area:—100 acres, average depth 4 feet.

Estimated production:—

43,023 tons peat fuel with 25% moisture.

This peat bog is practically valueless.

BOGGY CREEK PEAT BOG.

Location:—12 miles from Point Dubois.

Area:—661 acres.

Depth and cubical contents:—

216 acres less than 5 feet deep .... 1,372,592 cub. yds.

445 acres 10 feet and more deep .... 5,021,769 cub.yds.

Estimated production:—

567,607 tons of peat fuel with 25% moisture.

General remarks:—

The bog is well situated as regards transportation facilities, since the middle part is traversed by the City of Winnipeg Construction Railway.

The peat would furnish a fairly good but light fuel. The content of ash is not excessive, and the calorific value about satisfactory.

RICE LAKE PEAT BOG.

Location:—7½ miles from Point Dubois.

The bog has a very small area. The peat is poorly humified, not uniform in quality, and cannot be used for the manufacture of peat fuel.

MUD LAKE PEAT BOG.

Location:—3 miles from Point Dubois.

Area:—

139 acres; average depth, 9 feet, containing 2,011,667 cubic yards.

Estimated production:—

208,617 tons of peat fuel with 25% moisture.

General remarks:—

The peat is fairly well humified and uniform in quality, and can be used for the manufacture of peat on a small scale, but the finished product will be comparatively light.

The bog is advantageously situated as regards shipping facilities, being traversed by the City of Winnipeg Construction Railway.

LITTER PEAT BOG.

Location:—2 miles from Point Dubois, covering 110 acres.

82 acres are best adapted to the production of peat litter, the estimated production being 104,330 tons, with 20% moisture.

The remaining 28 acres are adapted to manufacture of peat fuel, and are estimated to yield 48,173 tons.

This bog is 70 miles from Winnipeg.

JULIUS PEAT LITTER BOG.

Location:—1 mile west of Shelley, Man.

Area:—

996 acres less than 5 feet deep	5,756,091 cub. yds.
1954 acres less than 10 feet deep	21,329,339 cub. yds.
946 acres more than 10 feet deep	17,297,084 cub. yds.

Estimated production:—

2,448,881 tons of peat litter with 20% moisture.

CONEY ISLAND PEAT BOG.

Location:—On Coney Island, Lake of the Woods, one mile from Kenora, Ont.

Area:—25 acres, average depth 8 feet.

Estimated production:—

32,267 tons of peat fuel with 25% moisture.

CROZIER PEAT BOG.

Location:—6 miles from Fort Francis, Ont.

Area:—355 acres, average depth 14 feet.

Estimated production:—

518,291 tons of peat litter with 20% moisture.

FORT FRANCIS PEAT BOG.

Location:—1 mile from Fort Francis, Ont.

Area:—1700 acres.

929 acres less than 5 feet deep .... 4,995,959 cub. yds.
691 acres less than 10 feet deep .... 7,803,693 cub. yds.
86 acres more than 10 feet deep .... 1,433,716 cub. yds.

Estimated production:—

891,205 tons of peat fuel with 25% moisture.

General remarks:—

The bog is very advantageously situated in regard to shipping facilities and market, being only one mile from Fort Francis, and traversed on the south side by the Canadian Northern Railway.

In addition to the above, preliminary investigations are reported as follows:

WHITEMOUTH OR TRANSCONTINENTAL MARSH.

The portion preliminarily investigated covers about 97,000 acres. The total area of the bog is supposed to be 200,800 acres, between Winnipeg River and Whitemouth Lake, and following the Whitemouth River on the east side.

Under present conditions the bog cannot very well be employed for the manufacture of peat fuel, or even peat litter, for the reason that the peat is not sufficiently humified for the former, and too much humified for the latter. If this enormous area were thoroughly drained, the peat in the middle region north of the Canadian Pacific Railway would rapidly humify, and could be utilized for the manufacture of a fairly good peat fuel. Such drainage would involve, under present unsettled conditions of the country, a great expenditure of money; but considering the value of the land that would be recovered for agricultural purposes, land which is at present practically valueless, and taking into account the improvement which would result in the surrounding farming land, consequent upon this drainage, the undertaking would eventually be a paying proposition.

Plum Marsh (90,000 acres), Netley Marsh (25,000 acres), Clandeboye Marsh (27,000 acres), Big Grass Marsh (50,000 acres), the Douglas Peat Bog (13,000 acres), McCreary Marsh, Ochre River or Turtle Marsh (9,000 acres), and the Dauphin Marsh (6,000 acres), are reported as unsuited to the manufacture of peat fuel or peat litter. By draining, however, these extensive areas can be economically recovered, and thus become valuable for use as agricultural land.

Journal of the Canadian Peat Society

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EDITORIAL.

The present number begins Vol. II. of the Journal of the Society. No issue having been in November, 1912, all subscriptions which would otherwise have commenced in that month will be continued to the end of 1913.

Since our last issue an important investigation of peat power plants in Europe has been made under the direction of the Mines Branch of the Department of Mines by Mr. B. F. Haanel, assisted by Mr. John Blizard. It is hoped that some information as to the result of this investigation will be available for the next issue of the Journal.

TO MAKE BRIQUETTES FROM LIGNITE.

A proposition for the establishment of a lignite-briquetting plant at the Manitoba-Saskatchewan mines near Estevan was recently made to the Saskatchewan legislature by Senator R. Watson, Sir William White and Sir Daniel McMillan. Their proposal was along the line that their Syndicate and the Government should put up $50,000 each, thus becoming equally interested in the project.

It is stated that the coke briquetting plant proposed to be employed can produce briquettes from lignite coke of the same, or nearly the same, B.T.U. as good anthracite coal at a cost of $3.68 per ton at the mines.

BY-PRODUCTS PROFITABLE.

In addition, it is claimed, there are by-products such as 10,000 cubic feet of gas (part of which returns to the machines and is used for heat) per ton, light oils, pitch, ammoniacal liquor, carbolic oils, creosote oils, etc., which will sell altogether for pretty nearly the cost of producing the briquettes.

The lignite coke briquettes are said to burn with a steady, low flame, with practically no smoke, no gas, and no odor. The briquettes retain their shape until thoroughly burned out, and there are no clinkers.

The government has retained the inventor for the coming year, so that he can prove to them with a single unit plant that he has a solution of the problem of using lignite coal advantageously.

PEAT AND WOOD WASTE FOR PULP

Wilhelm Hellwig, a German paper maker, and F. Hermann, manufacturer, have been granted a patent (G.B.) for an approved process for rendering peat, wood waste and other vegetable substances suitable for manufacturing paper pulp. The material is placed in a warm solution of chloride of lime, dilute hydrochloric acid, and potash of soda, and allowed to remain for some time. After this the mass is boiled in lime water. One example is: 10 kilograms of 90 per cent. calcined soda dissolved in 100 litres boiling water, is boiled for a time, stirring at intervals. Two kilograms of chloride of lime are added in the form of paste. When the mixture is cool there is added 3 kilograms of hydrochloride acid of about 20 degrees Be. Material placed in this liquor is left for twenty-four hours (the liquor being, preferably, warmed). The material is then removed and put into boiling water into which has been introduced 5 per cent. of burned lime. In this the material is boiled for about two hours, after which it is removed, and washed in clean cold water. The resulting mass is ready for further treatment in the ordinary way. (Pulp and Paper Magazine, Jan. 15, 1913.)

The Following Table Shows the Analyses from the Different Peat Samples Collected in Ontario.

No. of Samples from each Bog	Peat from	Composition of Peat.	Volatile matter	Fixed carbon	Ash	Phosphorus	Sulphur	Nitrogen	Calorific value, B.T.U. per lb.
			ANALYSES OF PEAT (absolutely dry).						
1	Mer-Bleu, Ontario	Sphagnum more or less mixed with eriophorum	65.90	24.22	10.88				8821
2	" "		67.57	25.35	7.18	0.026	0.314	1.40	9023
3	" "		68.40	25.00	6.60				8805
4	" "		63.22	24.86	11.92				9126
5	" "		68.76	25.73	5.51				9441
6	" "		68.73	26.27	5.00	0.024	0.317	1.13	9301
7	" "		69.49	26.04	4.47				8730
1	Alfred, Ontario	Principally formed by sphagnum	68.13	26.56	5.31	0.029	0.292	1.23	9058
2	" "		68.72	24.22	7.06	0.022	0.375	1.92	9118
1	Welland, Ontario	Sphagnum mixed with carex, eriophorum, and hypnum	67.14	26.48	6.38	0.027	0.317	1.13	8596
2	" "		70.90	24.84	4.26	0.024	0.248	1.74	8667
3	" "		70.53	24.28	5.19				8721
1	Newington, Ontario	Sphagnum slightly mixed with aquatic plants.	66.75	25.77	7.48	0.028	0.530	1.85	8465
2	" "		67.07	26.27	6.66	0.030	0.494	1.80	8877
3	" "		68.84	26.65	4.51				8336
4	" "		71.32	24.41	4.24	0.032	0.345	1.63	9102
5	" "		69.54	26.75	3.71				8210
6	" "		65.77	27.30	6.93				8312
7	" "		66.97	26.70	6.33				9067
1	Perth, Ontario	Sphagnum mixed with hypnum.	70.34	25.35	4.31	0.030	0.405	1.66	9148
2	" "		71.51	24.60	3.89	0.027	0.334	1.94	8649
1	Victoria Road, Ontario	Hypnum mixed with sphagnum.	69.52	25.18	5.30	1.73	0.303	0.035	8850
1	Brunner, Ontario	Principally hypnum	64.09	25.16	10.75	1.63	1.34	0.087	7490
1	Komoka, Ontario	Sphagnum mixed with carex	60.90	18.52	20.58	2.41	0.90	0.038	8173
1	Brockville, Ontario	Carex slightly mixed with eriophorum and aquatic plants.	66.70	21.75	11.75				
1	Rondeau, Ontario	Carex mixed with remains of grasses and aquatic plants.	61.00	22.90	16.10	2.77	0.73	0.049	7914
1	Alfred, Ontario: part of bog	Sphagnum slightly mixed with hypnum and eriophorum.	68.23	26.00	5.77	1.76	0.218	0.033	9005

*From Bulletin 8, Department of Mines, Mines Branch.

Peat Bogs Investigated in Manitoba during the year 1911

The names of the peat bogs.	Locality		Approximate total area.	Volume of workable Peat.			Partial analyses of absolutely dry Peat				Remarks.
	Townships	Range		Tons of fuel with contents 25 p.c moisture	Tons of litter with contents 20 p.c. moisture	Cubic yards	Fixed carbon	Volatile matter	Ash	Calorific value	
Lac du Bonnet	14	10 E	249	59,371		445,280	25.0	59.4	15.6		Principally formed by sphagnum
Transmission	15	12 E	1,375	936,379		7,022,840	24.2	56.8	19.0		Principally formed by sphagnum and carex
Corduroy	15	12 E	100	43,023		322,666	9.1	34.8	56.1		Principally formed by sphagnum and aquatic plants.
Boggy Creek	15	12-13 E	661	567,607		4,257,049	26.7	65.0	8.3	8730	Principally formed by carex
Rice Lake	15	13 E									
Mud Lake	15	14 E	139	208,617		1,564,629	23.2	69.1	7.7	8760	Principally formed by sphagnum
Litter (Peat Litter)	15	14 E	82		104,230	1,389,739					Principally formed by sphagnum and carex
Litter (Peat fuel)	15	14 E	28	48,173		361,387					Principally formed by sphagnum
Julius	11-12	10 E	3,896		2,148,880	32,651,756					Principally formed by sphagnum
		Total	6,530	1,863,170	2,553,110	48,015,346					

From Bulletin 8, Department of Mines, Mines Branch.

RETAIL PRICES OF FUEL IN CANADA.

The following tables set forth the retail prices prevailing on, or about, the fifteenth of each month from May, 1910, to December, 1912, inclusive, of coal and wood in the leading centres of industry throughout Canada.

The list of localities includes nearly every place having a population of 10,000 people, and is representative of every Province in the Dominion.

The quotations were furnished to the Department of Labour by the correspondents of the Labour Gazette in the respective localities, under detailed instructions from the Department as to sources of information, quality of goods to be quoted, etc., and have been compiled from the tables of Retail Prices of Staple Articles of Consumption, published monthly in the Labour Gazette.

The prices quoted are per ton of 2,000 lbs. of coal, and per cord of wood.

Abbreviations:—H.C.—Hard Coal (Anthracite).
S.C.—Soft Coal, (bituminous, in some cases in the Western Provinces, lignite)
H.W.—Hard Wood.
S.W.—Soft wood.

RETAIL PRICES OF FUEL IN CANADA.

	SYDNEY, N.S.				WESTVILLE, N.S.				AMHERST, N.S.				HALIFAX, N.S.			
1910	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.
May	7.50	3.00	4.00	—	—	3.20	—	—	6.50	4.75	5.00	3.75	7.00	5.00-5.25	5.50	3.50
June	"	"	"	—	—	"	—	—	6.20	"	"	4.00	6.60	4.75-5.00	"	"
July	"	"	"	—	—	"	3.50-4.00	—	6.50	4.60	"	"	6.70	"	"	"
August	"	3.20	"	—	—	"	"	—	6.20	4.70	"	"	6.80	"	"	"
September	"	3.00	"	—	—	"	"	—	6.50	4.75	"	"	7.00	6.00	8.00	7.00
October	"	"	"	—	—	"	"	—	"	4.65	"	"	"	5.00-5.25	5.50	3.50
November	"	"	"	—	—	"	"	—	"	4.75	"	"	"	"	"	"
December	"	"	"	—	—	"	"	—	"	"	"	"	"	"	"	"
1911																
January	"	3.50	6.50	3.50	7.50	5.50	5.50	3.50	"	"	"	"	"	"	"	"
February	"	"	"	"	—	3.20	3.50-4.00	—	"	4.60	"	"	"	"	"	"
March	6.50	"	4.50	"	—	"	"	—	"	4.75	"	"	"	"	"	"
April	"	"	"	"	—	"	"	—	"	4.70	"	"	"	"	"	"
May	"	"	"	"	—	"	"	—	"	"	"	"	"	"	"	"
June	"	"	"	"	—	"	"	—	6.75	"	"	3.50	6.80	4.75-5.00	"	"
July	"	"	"	"	—	"	"	—		4.60-4.75	"	4.00	6.90	"	"	"
August	"	"	"	"	—	"	"	—		—	"	"	7.00	"	"	"
September	"	"	"	"	—	"	"	—	6.75	4.70	"	"	7.10	5.00-5.25	"	"
October	"	"	"	"	—	"	"	—	6.50	"	"	"	7.20	"	"	"
November	"	"	"	"	—	"	"	—	6.75	"	"	"	"	"	"	"
December	"	"	"	"	—	"	"	—	"	4.60	"	"	7.25-7.50	"	"	"
1912																
January	"	"	"	"	—	"	"	—	—	—	"	"	7.50	"	5.00	"
February	8.00	"	4.00	2.50	—	"	"	—	7.25	4.60	"	"	"	"	5.50	"
March	"	"	"	"	—	"	4.00	3.50	"	"	"	"	7.75	5.25-5.50	"	"
April	—	"	"	"	—	"	"	"	"	"	"	"	9.00	"	"	"
May	—	"	"	"	—	"	"	"	"	"	"	"	8.00	"	"	"
June	—	"	"	"	—	"	"	"	"	"	"	"	7.00-7.25	5.00-5.25	"	3.00
July	—	"	"	"	—	"	"	"	"	"	"	"	7.25	5.25	"	3.50
August	7.25	"	"	"	—	"	"	"	"	"	"	"	7.50	5.25	"	"
September	"	"	"	"	—	"	"	"	"	"	"	"	7.75	5.50	"	"
October	"	"	"	"	—	"	"	"	8.50	4.75	"	"	8.50	"	"	"
November	8.00	"	"	"	—	"	"	"	10.50	"	"	"	9.00	5.75	"	"
December	"	"	"	"	—	"	"	"	"	"	"	"	"	"	"	"

RETAIL PRICES OF FUEL IN CANADA—*Continued.*

	CHARLOTTETOWN, P.E.I.				MONCTON, N.B.				ST. JOHN, N.B.				FREDERICTON, N.B.			
1910	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.
May	6.50	4.00	—	—	7.25	5.50	4.50	3.50	6.50-6.75	4.85-5.50	8.00-9.00	4.00	—	—	—	—
June	"	"	—	—	6.25	"	"	3.25	6.75-7.00	"	"	"	—	—	—	—
July	"	"	—	—	6.50	"	"	"	"	"	"	"	—	—	—	—
August	"	"	—	—	6.35	"	"	"	"	"	"	"	—	—	—	—
September	5.85	3.90	—	—	"	"	"	"	"	"	"	"	—	—	—	—
October	6.50	—	—	—	6.50	"	"	3.50	6.50-7.00	5.10	"	"	—	—	—	—
November	"	4.00	—	—	6.75	5.25	"	3.25	"	"	"	"	—	—	—	—
December	"	"	—	—	"	"	"	"	"	"	"	"	—	—	—	—
1911																
January	"	"	—	—	7.00	"	"	"	"	"	"	"	—	—	—	—
February	"	"	—	—	7.00-7.50	"	"	"	"	"	"	"	—	—	—	—
March	"	"	—	—	"	"	"	"	"	"	"	"	—	—	—	—
April	"	4.50	—	—	7.25	"	5.00	3.50	"	"	"	"	—	—	—	—
May	"	4.00	—	—	7.50	"	"	"	"	"	"	"	—	—	—	—
June	"	"	—	—	7.25	"	"	"	"	"	"	"	—	—	—	—
July	"	"	—	—	6.50	"	"	"	"	"	"	"	—	—	—	—
August	"	"	—	—	"	"	"	"	"	5.00	"	"	7.25	6.25	5.00	4.00
September	"	"	—	—	"	"	"	"	"	5.10	"	"	6.75	6.00	"	"
October	"	"	—	—	6.75	"	"	"	7.00-7.75	"	"	"	—	—	—	—
November	"	"	—	—	7.00	"	"	"	"	"	"	"	—	—	—	—
December	"	"	—	—	7.50	"	"	"	"	"	"	"	—	—	—	—
1912																
January	"	"	—	—	8.00	"	"	"	"	"	"	"	6.75	6.50	6.50	4.00
February	"	"	—	—	8.25	"	5.25	"	"	"	"	"	8.00	"	"	"
March	—	—	—	—	8.75	"	"	"	7.50-8.00	"	"	"	"	"	"	"
April	—	—	—	—	—	"	"	"	"	"	"	"	"	"	"	"
May	—	—	—	—	—	"	"	"	7.50	"	"	"	"	"	"	"
June	—	—	—	—	—	"	"	"	"	"	"	"	7.50	6.50	"	"
July	6.50	4.25	—	—	—	"	"	"	"	"	"	"	"	"	"	3.00
August	6.75	"	—	—	7.50	"	5.50	"	"	"	"	"	8.50	6.50	"	"
September	"	"	—	—	7.75	"	"	"	"	"	"	"	"	"	"	"
October	7.00	4.50	—	—	8.00	"	"	"	9.00	5.70-6.00	"	"	9.00	"	"	"
November	"	"	—	—	—	"	"	"	8.75	5.10	"	"	"	"	"	"
December	"	"	—	—	—	"	"	"	"	"	"	"	"	"	"	4.00

RETAIL PRICES OF FUEL IN CANADA—*Continued.*

	NEWCASTLE, N.B.				QUEBEC, QUE.				THREE RIVERS, QUE.				SHERBROOKE, QUE.			
1910	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.
May	7.00	5.00	4.00	3.00	7.25	4.75	7.00-8.00	5.00-6.00	6.50	5.00	6.50	4.00	6.80	5.90	4.25-4.50	3.50-4.00
June	6.50	4.50	"	"	"	"	"	"	"	"	"	"	6.90	"	"	"
July	7.00	5.25	"	"	"	"	6.00-7.00	4.50-5.50	"	"	"	"	"	"	"	"
August	"	"	"	"	"	"	5.50-6.50	4.00-5.00	"	"	"	"	7.00	"	"	"
September	"	"	"	"	"	"	6.00-7.00	4.50-5.50	"	"	"	"	7.10	"	4.75-5.00	"
October	"	5.00	"	"	"	"	"	"	6.75	"	"	"	7.50	"	4.25-4.75	"
November	"	"	"	"	"	4.25	"	"	7.00	"	"	"	7.40	4.75	5.00-5.25	4.00
December	"	"	"	"	7.50	5.00	"	"	7.25	"	"	"	7.50	"	5.00	"
1911																
January	7.50	"	"	"	7.50-7.75	5.00-5.50	"	4.50-5.00	"	"	"	"	"	"	"	"
February	"	5.50	"	"	"	"	"	"	"	"	"	"	"	"	"	"
March	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
April	7.25	5.25	"	2.50	"	"	"	4.50-5.50	"	"	"	"	6.80	6.00	"	4.50
May	"	"	"	"	7.25	4.50	"	"	6.50	"	"	"	"	"	"	"
June	7.50	5.50	"	"	"	4.50-5.00	"	"	"	"	"	"	6.90	"	"	"
July	"	"	"	"	"	"	"	"	6.75	"	"	"	7.00	"	"	"
August	"	"	"	"	"	"	"	"	"	"	"	"	7.10	"	"	"
September	"	"	"	"	7.50	4.75-5.75	"	"	"	"	"	"	7.20	"	"	"
October	"	"	"	"	"	"	"	"	"	"	"	"	7.30	"	"	"
November	8.00	5.25	"	"	"	"	"	"	"	"	"	"	7.50	"	"	"
December	"	"	"	"	7.75-8.00	5.00-6.00	"	4.00-5.00	7.00	"	"	"	"	"	"	"
1912																
January	"	"	"	3.00	"	"	"	4.50-5.50	7.50	"	"	"	"	"	"	"
February	9.00	"	4.50	3.50	"	"	"	"	"	"	"	"	"	"	"	"
March	"	"	"	"	9.00	"	"	"	"	"	"	"	"	"	"	"
April	10.00	"	"	"	12.00	"	"	"	"	"	"	"	"	"	"	"
May	—	—	—	—		"	"	"	"	"	"	"	"	"	"	"
June	—	—	—	—	8.00	4.50-5.50	"	"	"	"	"	"	7.15	"	"	"
July	—	—	—	—	"	"	"	"	6.90	"	"	"	7.25	"	"	"
August	—	—	—	—	"	4.50-5.00	"	"	"	"	"	"	7.35	"	"	"
September	—	—	—	—	8.25	"	"	"	7.00	"	"	"	7.45	"	"	"
October	—	—	—	—	"	"	"	"	"	"	"	"	7.50	"	"	"
November	—	—	—	—	10.00	5.00-5.50	"	"	7.50	"	"	"	8.50	"	"	"
December	—	—	—	—	10.-12.	"	"	"	"	"	"	"	"	"	"	"

RETAIL PRICES OF FUEL IN CANADA—*Continued.*

	HULL, QUE.				OTTAWA, ONT.				BROCKVILLE, ONT.				KINGSTON, ONT.			
	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.
1910																
May	7.50	5.50	3.50	2.75	7.50	5.50	6.50	3.25	—	—	—	—	7.00	6.25	7.00	4.50
June	7.25	"	5.50	3.50	"	"	"	3.50	—	—	—	—	"	"	"	"
July	"	"	"	—	"	"	"	"	—	—	—	—	"	"	"	"
August	"	"	"	—	"	"	"	"	—	—	—	—	"	"	"	"
September	"	"	"	3.50	"	"	"	"	—	—	—	—	"	"	"	"
October	7.50	"	"	"	"	"	"	"	—	—	—	—	"	"	"	4.15
November	"	"	"	"	"	"	"	3.25-3.75	—	—	—	—	"	"	"	4.50
December	"	"	"	3.00	"	"	"	3.75	—	—	—	—	"	"	"	"
1911																
January	"	"	"	3.50	"	"	"	3.25-3.75	—	—	—	—	"	"	"	"
February	"	"	"	"	"	"	"	3.75	—	—	—	—	"	"	"	"
March	"	"	"	"	"	"	6.00	3.50	—	—	—	—	7.50	"	"	"
April	"	"	"	"	"	"	6.50	3.25	—	—	—	—	7.00	"	"	"
May	"	"	"	"	"	"	"	"	—	—	—	—	"	"	"	"
June	"	"	"	"	"	"	"	"	—	—	—	—	"	"	"	"
July	"	"	"	"	"	"	"	"	—	—	—	—	"	"	"	"
August	"	"	"	"	"	"	"	"	—	—	—	—	"	"	"	"
September	"	"	"	"	"	"	"	"	—	—	—	—	"	"	"	"
October	7.75	"	"	"	"	"	"	"	—	—	—	—	"	"	"	"
November	7.50	"	"	"	"	"	—	—	—	—	—	—	"	"	7.50	"
December	"	"	"	"	"	"	—	—	—	—	—	—	"	"	7.00	"
1912																
January	7.75	"	"	"	"	"	7.00	3.50	7.00	—	5.00	4.00	"	"	7.50	"
February	"	"	"	"	7.75	"	"	"	"	"	"	"	"	"	7.00	"
March	7.75-8.00	5.00	"	4.00	"	"	"	"	"	—	6.00	"	8.00	6.25	"	"
April	7.75	"	"	"	"	"	"	"	"	—	6.50	4.50	7.25	5.50	"	5.00
May	"	"	"	"	"	"	"	"	"	—	6.00	"	"	"	"	"
June	"	"	"	"	"	"	"	"	7.50	5.00	"	"	7.75	"	"	"
July	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
August	7.25	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
September	8.00-8.25	5.25	6.00	"	"	"	"	"	"	"	"	"	"	"	"	"
October	"	"	"	"	8.00	"	"	"	"	"	"	"	"	"	"	"
November	8.00	5.50	"	"	"	"	7.50	4.00	"	"	"	"	"	"	"	"
December	"	"	"	4.50	"	"	"	4.50	"	"	"	"	"	"	"	"

RETAIL PRICES OF FUEL IN CANADA—*Continued.*

	SOREL, QUE.				ST. HYACINTHE, QUE.				ST. JOHNS, QUE.				MONTREAL, QUE.			
1910	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.
May	—	—	—	—	7.25	5.25	5.00-7.00	4.00-4.50	6.25	5.00	7.50	6.00	7.00	6.50	8.00	5.00
June	—	—	—	—	6.50	"	5.00-7.50	"	"	"	"	"	—	—	—	—
July	—	—	—	—	"	"	"	"	"	"	"	"	—	—	—	—
August	—	—	—	—	6.75	"	"	"	6.00	"	8.00	"	7.00-7.50	6.75	7.00	5.00
September	—	—	—	—	"	"	"	"	6.25	"	7.50	"	—	—	—	—
October	—	—	—	—	7.00	5.50	"	"	"	"	8.00	"	—	—	—	—
November	6.75	5.25	5.00-6.00	3.50-4.75	7.50	"	"	"	"	"	"	"	—	—	—	—
December	"	5.00	6.25	5.00-5.50	"	"	"	"	6.50	"	"	"	—	—	—	—
1911																
January	"	4.75	6.50	5.25	"	5.00	7.00	5.00	"	"	"	"	7.25	7.00	8.00	5.50
February	"	4.25	"	4.75	7.25	5.25	5.00-7.50	4.50	"	"	"	"	7.00	6.75	"	5.00
March	6.50	4.75	6.25	5.50	7.50	5.00	6.50-7.00	5.00	"	"	"	"	7.25	7.00	"	"
April	6.75	4.50	6.25-6.50	4.25-4.75	"	"	"	"	"	"	"	"	"	6.75	"	6.00
May	"	"	"	4.50	"	"	"	"	6.00	"	"	"	7.50	"	"	"
June	"	"	"	4.75	"	"	"	"	6.25	"	"	"	"	"	"	"
July	6.25	"	"	4.25	7.70	"	"	"	6.50	"	"	"	"	7.00	"	"
August	6.75	"	"	"	6.75	"	"	4.50-5.00	"	"	"	"	"	"	"	"
September	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
October	"	4.75	"	4.50	"	"	"	"	"	"	"	"	"	"	"	"
November	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
December	"	"	"	"	"	"	"	"	"	"	"	"	7.75	"	"	"
1912																
January	6.50-6.75	5.00	6.50	4.00	7.50	"	"	"	"	"	-		"	6.50	"	4.50
February	"	"	"	"	"	"	"	"	7.00	6.00	6.00	4.00	"	"	"	"
March	7.00	"	"	"	9.00	"	5.50-7.00	"	8.00	"	"	5.00	7.75-9.00	"	"	"
April	"	"	"	"	7.50	"	"	"	8.50	"	6.50	"	8.00-9.50	"	"	"
May	"	"	"	"	8.00	"	"	"	"	"	"	"	7.75	"	8.35	4.85
June	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
July	"	"	"	"	"	5.50	"	"	6.60	5.00	6.00	4.50	"	"	"	"
August	"	"	"	"	"	5.00	"	"	7.00	5.50	"	"	7.50	"	"	"
September	7.50	"	"	"	7.50	5.50	"	"	7.25	5.75	"	"	8.25	"	"	"
October	8.00	"	7.00	5.00	"	"	"	"	7.75-8.50	6.00	6.50	5.00	9.50-10	"	"	"
November	"	"	"	"	"	"	"	"	7.75	"	"	"	8.50-10	"	"	"
December	"	"	"	"	10.50	7.00	"	"	8.25	6.50	"	"	"	"	"	"

RETAIL PRICES OF FUEL IN CANADA—*Continued.*

	BELLEVILLE, ONT.				PETERBOROUGH, ONT.				TORONTO, ONT.				NIAGARA FALLS, ONT.			
1910	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.
May	6.75	5.00	6.00	—	7.00	5.50	6.00	2.75	6.50	5.00	7.50	6.50	6.25	4.00	7.00	5.00
June	"	"	"	—	7.10	"	"	"	"	"	"	"	"	"	"	"
July	"	"	"	—	7.20	"	"	"	"	"	"	5.00	"	"	"	"
August	"	"	7.00	—	7.30	"	"	"	6.75	"	"	"	"	"	"	"
September	—	—	6.50	4.50	7.40	"	"	3.00	"	"	"	"	6.00	"	"	4.00
October	—	—	—	—	7.50	"	"	"	7.00	5.00-6.00	7.50-8.00	5.50	"	"	"	5.00
November	7.00	5.00	—	—	"	"	"	"	"	5.50	"	5.00	"	"	"	"
December	—	—	—	—	"	"	5.50	"	"	"	"	"	"	"	"	"
1911																
January	—	—	—	—	"	"	6.00	3.50	7.50	6.00	"	"	"	"	"	"
February	—	—	—	—	"	"	"	"	"	"	"	"	"	"	"	"
March	—	—	—	—	"	"	"	"	"	"	"	"	"	"	"	"
April	—	—	—	—	"	"	"	"	"	"	7.50	"	"	"	"	"
May	—	—	—	—	7.00-7.25	"	"	"	6.75	5.00	"	"	"	"	"	"
June	—	—	—	—	7.10	"	"	"	"	"	"	"	"	"	"	"
July	—	—	—	—	7.20	"	"	"	6.75-7.00	"	"	"	"	"	"	"
August	7.00	5.50	7.00	5.00	7.30-7.55	"	"	"	"	"	"	"	6.25	4.50	"	"
September	6.75	5.00	"	5.50	7.40	"	"	"	7.00-7.25	"	"	"	"	"	"	"
October	7.00	5.50	"	5.00	7.50-7.75	"	"	"	"	"	"	"	"	"	"	"
November	—	—	—	—	"	6.00	"	"	"	"	"	"	"	"	"	"
December	7.25	5.25	7.00	5.00	"	5.50	"	"	7.25-7.50	"	8.50	5.50	"	"	"	"
1912																
January	7.00	4.95	6.75	"	"	"	"	"	"	"	"	"	"	"	"	"
February	7.25	6.75	5.00-6.00	—	"	"	"	"	"	"	"	"	"	"	"	"
March	7.50	—	6.00	5.00-5.50	"	"	7.00	"	"	"	"	"	"	"	"	"
April	7.25	4.75	7.00	5.00	"	"	"	"	"	"	"	"	"	"	"	"
May	7.00	"	"	"	"	"	"	3.00	7.25	"	"	"	"	"	"	"
June	"	"	"	"	"	"	"	3.50	7.25-7.50	5.50	"	"	"	"	"	"
July	7.25	5.00-5.50	6.50	4.50-5.00	7.60-7.85	"	"	"	"	"	"	"	6.50	4.75	"	"
August	7.50	"	"	"	7.70-7.95	"	"	"	7.50-7.75	"	"	"	"	"	"	"
September	"	"	"	"	7.80	"	"	"	8.00	"	"	"	6.75	5.00	"	"
October	8.00	"	"	"	8.25	"	"	"	"	"	"	"	"	"	"	"
November	8.50	"	"	"	"	"	"	"	8.25	"	"	"	7.00	"	"	"
December	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"

RETAIL PRICES OF FUEL IN CANADA—*Continued.*

	ST. CATHERINES, ONT.				HAMILTON, ONT.				BRANTFORD, ONT.				GUELPH, ONT.			
1910	H.C.	S.C.	H.W.	S.W.	H.C.	S.C	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.
May	7.00	—	8.00	5.00-6.00	6.75	5.50	7.00	5.50	6.75	5.00	8.00	5.00	6.50	4.50	8.00	6.50
June	"	—	"	"	"	"	"	"	"	"	"	"	"	"	"	"
July	"	—	"	5.00	"	"	"	"	"	"	"	"	"	5.00	"	5.50
August	6.50	—	"	5.00-6.00	"	"	"	"	"	"	"	"	"	"	"	"
September	"		"	6.00	"	"	"	"	7.00	"	"	"	6.75	"	"	"
October	6.75	—	"	"	"	"	"	"	"	"	"	"	"	"	"	"
November	"	—	"	"	"	"	"	"	"	"	"	"	7.00	5.50	"	"
December	"		"	"	7.00	5.75	7.25	5.75	7.25	"	"	"	"	"	"	"
1911																
January	7.00	—	"	"	"	"	7.50	"	"	"	"	"	"	"	"	"
February	"	—	"	"	"	"	--		"	"	"	"	7.25	"	"	"
March	"		"	"	"	"	7.25	5.75	"	"	"	"	"	5.00	"	5.00
April	"		"	5.50-6.00	"	5.50-6.00	8.00	6.00	"	"	"	"	6.75	5.50	"	"
May	"		"	"	6.75	5.25-5.75	"	"	7.00	"	"	"	"	5.00	"	"
June	"		"	5.00-6.00	"	"	"	"	"	"	"	"	6.50	"	"	"
July	6.50		"	"	"	"	"	"	"	"	"	"	6.75	"	"	"
August	6.75		"	"	"	"	"	"	"	"	"	"	"	"	"	"
September	"		"	"	7.00	"	"	"	7.25	"	"	"	7.00	"	"	"
October	"		"	"	"	"	"	"	"	"	"	"	7.25	"	"	"
November	7.00	—	"	"	"	"	"	"	"	"	"	"	"	"	"	"
December	"	—	"		"	"	"	"	"	"	"	"	"	"	"	"
1912																
January	"		"	"	"	"	"	"	"	"	"	"	"	"	"	"
February	"	—	"	"	"	"	"	"	"	"	"	"	"	"	"	"
March	"		"	6.00	"	"	"	"	"	"	"	"	"	"	"	"
April					"	"	"	"	"	"	"	"	"	"	"	"
May	7.50		7.00	5.00	"	"	"	"	"	"	"	"	"	"	"	"
June	—		8.00	6.00	7.25	"	"	"	"	"	"	"	"	"	"	"
July	7.00	5.00	8.50	7.50	"	"	"	"	"	"	"	"	"	"	"	"
August	"	"	"	"	"	"	"	"	7.50	"	"	"	7.50	"	"	"
September	"	4.75	"	"	7.50	"	"	"	7.75	"	"	"	"	"	"	"
October	7.25	"	"	"	8.00	"	9.00	7.00	8.25	"	"	"	7.75	5.50	"	"
November	7.50-7.75	4.75-5.00	"	"	"	6.00	"	"	8.00	5.75	"	6.50	8.00	"	"	"
December	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"

	BERLIN, ONT.				WOODSTOCK, ONT.				STRATFORD, ONT.				LONDON, ONT.			
	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.
1910																
May	6.75	4.50	8.00	5.00	6.50	5.00	7.50	6.00	6.50	6.50	8.50	7.00	6.50	6.50	8.00	6.00
June	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
July	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
August	"	"	"	"	6.25	4.00	"	"	"	"	"	7.50	6.75	"	"	"
September	"	"	"	"	"	4.50	"	"	"	"	"	7.00	7.00	"	"	"
October	"	"	"	"	6.75	4.00-4.50	"	"	7.00	6.00	"	"	"	"	"	"
November	"	"	"	"	"	4.50	"	"	"	"	"	"	"	"	"	"
December	7.25	5.00	"	"	6.00	"	"	"	"	"	"	"	"	6.00	"	"
1911																
January	7.25-7.50	"	"	"	7.00	"	"	"	"	"	"	"	7.00-7.50	"	"	"
February	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
March	"	"	"	"	7.00-7.25	"	"	"	"	"	"	"	"	"	"	"
April	"	"	"	"	7.25	"	"	"	"	"	"	"	6.00-7.50	"	"	"
May	6.75-7.00	"	"	"	"	"	"	"	"	"	"	"	6.75-7.00	"	"	5.50-6.00
June	"	"	"	"	7.00	"	"	"	"	"	"	"	"	"	"	"
July	"	"	"	"	"	"	"	"	6.50	"	"	"	7.00	"	"	"
August	7.00-7.25	"	"	"	"	"	8.00	"	"	"	"	"	6.75-7.00	"	"	"
September	7.50	"	"	"	"	"	"	"	"	6.50	"	"	7.25-7.50	"	"	6.00
October	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
November	"	"	"	"	7.00-7.25	"	"	"	"	"	"	"	"	"	"	"
December	"	"	"	"	7.25	"	"	"	7.00	7.00	"	"	"	"	"	"
1912																
January	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
February	"	4.50	"	"	"	"	"	"	"	"	"	"	"	"	"	"
March	"	"	"	"	"	5.00	"	"	"	"	"	"	"	"	"	"
April	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
May	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
June	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
July	"	"	"	"	7.50	"	"	"	"	"	"	"	"	"	"	"
August	"	5.00	"	"	"	"	8.50	"	"	"	"	6.00-7.00	"	"	"	"
September	"	"	"	"	"	"	"	"	7.75	7.75	"	"	7.50-7.75	6.50	"	"
October	8.00	6.00	8.50	5.50	8.00	"	"	"	8.00	8.00	"	"	7.50	"	"	"
November	"	"	"	"	"	"	"	"	"	"	"	"	7.50-8.00	"	"	"
December	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"

RETAIL PRICES OF FUEL IN CANADA—*Continued.*

	ST. THOMAS, ONT.				CHATHAM, ONT.				WINDSOR, ONT.				ORILLIA, ONT.			
1910	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.
May	7.00	6.00	6.50	2.75	7.00	5.00	5.00	3.50-4.00	7.50	5.00	8.00	4.50	—	—	—	—
June	"	"	"	"	"	"	"	4.00	"	"	"	"	—	—	—	—
July	"	"	"	"	"	"	4.75	3.50	"	"	"	"	—	—	—	—
August	"	"	"	"	"	"	4.50-5.00	3.00	"	"	"	"	—	—	—	—
September	"	"	8.00	7.00	"	"	"	—	"	5.50	"	"	—	—	—	—
October	"	"	6.50	5.50	"	"	—	—	"	5.00	"	"	—	—	—	—
November	"	"	6.00	4.00	"	"	5.00	4.00	"	"	"	"	—	—	—	—
December	7.25	"	"	"	7.25	"	4.50-5.00	3.50	"	"	"	"	—	—	—	—
1911																
January	"	"	6.50	3.50	"	"	"	3.00-3.50	"	"	"	"	—	—	—	—
February	"	"	6.00	"	"	"	5.00	4.00-4.50	"	"	"	"	—	—	—	—
March	"	"	"	"	"	"	—	—	"	"	"	"	—	—	—	—
April	"	"	"	"	"	"	—	—	"	"	—	"	—	—	—	—
May	"	"	"	"	"	"	—	—	"	"	8.00	4.00	—	—	—	—
June	"	"	"	"	"	"	—	—	"	"	"	4.50	—	—	—	—
July	"	"	"	"	"	"	—	—	"	"	"	"	—	—	—	—
August	"	"	"	"	"	"	—	—	"	"	"	"	—	—	—	—
September	"	"	"	"	"	"	—	—	"	"	"	"	—	—	—	—
October	"	"	"	"	"	"	—	—	7.75	"	"	"	—	—	—	—
November	"	"	"	"	"	"	—	—	"	4.50	"	5.00	—	—	—	—
December	"	"	"	"	"	"	5.00	—	"	5.00	"	"	—	—	—	—
1912																
January	"	"	"	"	"	"	—	—	"	"	"	4.50	7.50	5.50	6.00	3.50
February	"	"	"	"	"	"	—	—	"	"	"	5.00	"	"	"	"
March	"	"	"	"	"	"	—	—	"	"	"	"	"	"	"	"
April	"	"	"	"	"	"	—	—	"	"	"	"	"	"	"	"
May	"	"	"	"	"	"	—	—	"	"	"	"	"	"	"	3.75
June	7.50	"	"	"	"	"	—	—	"	"	"	"	7.50-7.75	"	"	"
July	"	"	"	"	"	"	5.00	—	"	"	"	"	7.65	"	"	4.50
August	"	"	"	"	"	"	—	—	"	"	"	"	7.80	"	"	"
September	"	"	"	"	7.50	"	—	—	"	"	"	"	8.00	"	"	"
October	"	"	"	"	7.75	5.25	—	—	8.00	"	"	"	"	"	"	"
November	8.00	"	"	"	9.00	"	—	—	"	"	"	"	7.75-8.00	"	7.00	"
December	"	"	"	"	"	"	—	—	"	"	"	"	8.75	6.00	7.50	5.50

RETAIL PRICES OF FUEL IN CANADA—*Continued.*

	OWEN SOUND, ONT.				COBALT, ONT.				SAULT STE. MARIE, ONT.				PORT ARTHUR, ONT.			
	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.
1910																
May	—	—	—	—	—	—	—	—	7.50	5.50	5.50	4.50	8.75	6.00	4.00-6.00	—
June	—	—	—	—	—	—	—	—	"	"	"	"	"	"	"	
July	—	—	—	—	—	—	—	—	"	"	"	"	7.55	6.50	4.50-6.00	3.00-4.50
August	—	—	—	—	—	—	—	—	8.00	"	6.00	5.00	"	"	"	3.50-4.50
September	—	—	—	—	—	—	—	—	"	"	"	4.50	"	"	"	"
October	—	—	—	—	—	—	—	—	"	"	"	5.00	8.00	6.00	6.00	4.00
November	—	—	—	—	—	—	—	—	"	"	"	"	"	"	5.00-6.00	3.50-4.50
December	—	—	—	—	—	—	—	—	"	"	"	4.00	"	6.50	"	3.00-4.00
1911																
January	—	—	—	—	—	—	—	—	"	"	"	"	—	—	—	—
February	—	—	—	—	—	—	—	—	"	"	"	"	—	—	—	
March	—	—	—	—	—	—	—	—	"	"	"	"	8.00	6.50	5.00-6.00	3.50-4.50
April	—	—	—	—	—	—	—	—	"	"	"	5.00	"	"	6.00	"
May	—	—	—	—	—	—	—	—	"	"	"	4.50	7.60	5.40	5.00-6.50	"
June	—	—	—	—	—	—	—	—	"	"	"	"	"	"	"	"
July	—	—	—	—	—	—	—	—	"	"	5.50	"	"	"	"	"
August	—	—	—	—	—	—	—	—	"	"	6.00	5.00	"	"	"	"
September	—	—	—	—	—	—	—	—	"	"	"	4.50	"	"	"	"
October	—	—	—	—	—	—	—	—	"	"	"	5.00	8.00	6.00	"	"
November	—	—	—	—	—	—	—	—	"	"	"	"	8.50	"	"	"
December	—	—	—	—	—	—	—	—	"	"	"	"	8.00	"	"	"
1912																
January	6.25	4.00	—	—	9.50	—	5.50	5.00	8.25	"	5.60-6.00	"	—	—	—	—
February	7.25-7.75	5.00-6.00	6.00	3.00	"	—	"	"	—	—	—	—	7.50	5.50	6.00-6.50	4.00-5.00
March	"	"	"	"	10.00	—	"	"	—	—	—	—	8.00	[illegible]	5.00-6.00	"
April	7.75	6.00	"	4.50	"	—	"	"	—	—	—	—	"	"	6.00-6.50	"
May	"	"	"	"	"	—	"	6.00	—	—	—	—	7.75	"	5.75-6.00	"
June	"	"	"	"	"	—	"	5.00	—	—	—	—	7.75-8.00	5.00	"	"
July	7.50	"	"	4.00	"	—	"	"	8.50	—	5.50	4.00	"	"	"	"
August	"	"	"	"	9.50	—	"	"	7.50	—	"	4.25	8.25-8.50	5.50	"	"
September	8.00	"	6.50	3.50	10.00	—	"	4.50	"	—	"	4.00	8.50	5.75	5.50-6.00	3.50-4.50
October	"	"	6.00	3.95	"	—	"	"	8.50	—	5.00	"	"	"	"	"
November	9.00	"	6.50	3.75	12.00	—	5.00	4.00	8.00	—	5.50	"	"	"	"	"
December	"	"	7.00	"	11.00	—	"	"	9.00	—	"	"	"	"	"	"

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ECONOMIC ASPECT OF THE PEAT INDUSTRY.

Ernest V. Moore, B.Sc. in paper read before the American Peat Society.

The fuel problem in Canada is a question of national concern. To those who have studied the subject, it has a very serious side to it beyond the advancing price of coal. If, for any reason the export of coal from the United States should be restricted, or worse, prohibited, the result to Canada would be alarming indeed. Nearly every industry would be tied up, and widespread suffering result. This is not a remote possibility; no less an authority than Mr. George Otis Smith, of the United States Geological Survey, in his report, advocates the prohibition of the export of coal from the United States in the following words: "Let us keep our coal at home, and with it, manufacture whatever the world needs."

Aside from the foregoing take the economic aspect of the question. Last year, 1911, 4,020,577 tons of anthracite coal were imported at a declared value of $18,794,192.00, and 10,538,315 tons of bituminous, valued at $20,498,399.00.

In 1902 the consumption of coal was 1,895 pounds per capita, in 1911 the consumption had risen to 3,588 pounds per capita, showing that Central Canada, at least, is more dependent year by year, for fuel, upon a foreign source of supply. Last year nearly $40,000,000.00 was sent out of Canada for fuel alone.

Canadian coal deposits are either in the far West, or, far East, and the long freight haul makes the cost, particularly in Ontario and Quebec, of supplies from either point, prohibitive.

Other fuels must be sought. Wood for fuel is now so scarce that it cannot supply the country's requirements. Peat fuel is the only article in sight to supply them, and with large deposits available the fuel question will find a solution in Canada's deposits .

Crude peat is not a marketable product, *but machined peat is.* It is cleaner, better, and cheaper fuel at from $5.00 to $5.50 per ton than anthracite coal at from $7.00 to $7.50.

While anthracite coal carries 12,000 to 14,000 heat units per pound, and peat fuel but 8,000 to 10,000, the available heat units in peat are much greater proportionately than in coal, because the waste in peat is about 4 to 5 per cent., while that in coal runs from 16 to 26 per cent. waste.

POSSIBLE SOURCES OF HEAT AND POWER IN THE FUTURE

The Mining and Engineer World, speculating on possible sources of heat and power in the future says:

> "The yearly production of vegetable matter on the earth is estimated at 32,000,000,000 tons, which if burned would yield a quantity of heat equal to that obtainable from 18,000,000,000 tons of coal—that is to say, 18 times as much heat as is furnished by all the coal now mined in Europe and America.
>
> "Is it not to be supposed that this production of plant substances may be so increased and intensified in selected regions as to supply all the fuel we can possibly want in the future We are now using for fuel purposes fossil solar energy in the form of coal. Why not utilize instead live solar energy?
>
> "Plants should be made to store up solar energy for conversion into mechanical energy. The kind of plants used is of no consequence. They may be grasses or trees; they may grow in swamps or dry places, on the sea coast or even in the sea. The essential point is that they shall grow fast or that their growth shall be accelerated.
>
> The production of plant substances over all the land surfaces of the earth averages 1 ton to the acre. By intensified culture it could be made 4 tons. This on 1 sq. mile would amount to 2560 tons, corresponding to about 1400 tons of coal.
>
> "In an epoch soon to arrive, the harvest of fuel plants dried by the sun will be converted entirely into gas for fuel purposes, separating out the ammonia, to be returned to the soil as nitrogenous fertilizer, together with all the mineral substances contained in the ashes. The gas thus obtained will be burned on the spot in gas engines, and the mechanical energy generated by this means will be transmitted over great distances, or utilized in any way that seems advisable. Even the carbonic acid resulting from combustion will be returned to the fields so that the latter may lose nothing of their productiveness."
>
> "Coal offers to mankind solar energy in its most concentrated form. Indeed modern civilization may be said to be the daughter of coal. But the supply of coal is not inexhaustible and every ton of it taken out of the earth leaves just that much less for the future needs of the world. Hence it is that today we are looking about us anxiously for some other source of fuel."

An important source of additional fuel for the more immediate future in Canada exists in our extensive peat bogs. These, and the great lignite areas of the Northwest, occupy a middle ground between coal on the one hand, and such vegetable fuels as wood, etc., on the other. With the reductions in our forest area due to settlement and other causes, and the consequent rise in fuel prices, the development of these latent resources has become a matter of general and immediate concern.

In order to carry out the principle of true conservation, what is called for is that this development shall proceed along such lines and by such methods as will secure the maximum of economic return. The indications are that this will be in many instances by production of power for distribution from a central station and utilization of by-products, as outlined by the Mining and Engineering World in the case of use of fuel plants. Successful installations have already been made in Europe employing such methods.

PEAT FOR PAPERMAKING.

A report on the Investigation of Peat Bogs and the Peat Industry of Canada is off the press by A. Anrep, the peat expert of the Dominion Government. Dealing with peat as a papermaking material, the report quotes from a report of Emil Hazulund as follows:

The question of manufacturing paper out of peat, especially out of unhumified sphagnum moss, has been raised many times. The inquiry has usually ended, however, with some small experiments. Scientific men in the paper industry do not seem to have had very much confidence in the results of these experiments; and this lack of confidence as will be shown was well founded.

The consistency of peat is such that, it cannot be expected to make strong and durable paper without the employment in its manufacture of complicated and extensive machinery necessary for the cleaning, bleaching and drying of the peat. This makes the finished product so expensive that it can hardly compete with the prices of the material now on the market.

At the Mosskulturforeining (Swedish Peat Society) museum is to be found a considerable collection of peat paper samples from different places. Some time ago several samples made from Irish peat were added. Comparison of these samples with those previously collected, caused an investigation to be made; to ascertain if they were made of peat.

Some of the tests of the strength of paper hereafter mentioned have been made according to the American standard by Engineer A. Skeppstedt at the Munksjo paper works—to whom I am indebted, and have to thank, for valuable written information. Several historical abstracts concerning foreign manufacturing have been taken from "Osterr-Moorzeitschrift." Herr Schreiber for many years gave short accounts of the different paper manufacturing firms and processes. Careful note was made of the length of time each firm lasted before going into bankruptcy, and of the losses entailed in each case.

(I) Pasteboard, manufactured at the Munksjo paper works in 1890, for experimental purposes, proved to be very loose, slightly glazed, thin, and golden brown in color, with dark stripes. Thinner paper was also produced. It had a tensile strength of about 15 English pounds, weighed 190 grams per square meter, and was 0.32 mm. thick.

Microscopic investigations. The main part of the material consists of unhumified perfectly hyaline (glass-like) sphagnum moss. The leaves are unfractured, and show, occasionally, distinct pores; but with a dissolved glass clear substance. The stems are often quite long, and extend right across the field of view at 80 times enlargement. The woody texture in these is whole, but the bark may be lacking. However, there is to be found perfect bark structures with distinct retort shaped absorption cells.

Eriophorum vaginatum appears in dark strips up to 1 centimetre long, 0.1 0.8 mm. wide. This, at the enlargement seems to consist of bast elements from leaf sheaths. It is also found with brown striped bast threads, and between these hyaline (glass-like) epidermis cells; fine roots of carex occasionally occur. Fibres of spruce, sphagnum spores, and spruce pollen, are found in small quantities.

It can readily be seen that pasteboard of the above quality cannot possess much strength. The leaves and stems of the sphagnum mosses contain very little of the thread or bast elements which are required for manufacturing paper. The filtering capacity of the leaves is extremely small, and decreases as they disintegrate. Even the stems which contain wood substance have a small quantity of fibre. The wood substance is composed of only a few cells and thick layers of weak and short wood cells with little substance. Inwardly the stem assumes the texture of pith and outwardly of bark (airbags).

The binding elements in this case are the added wooden substances and eriophorum, while the sphagnum can only be considered as a filler, and as such, it is for most purposes unsuitable.

(II) Pasteboard from Lindefor's paper factory is almost straw-color and consists of different thicknesses from 0.39 mm. to over 2.0 mm. The weight of the first-mentioned thickness is 300 grams per square meter and contains, according to the statements issued by the factory, 40 per cent. sphagnum moss and 60 per cent. woody substance.

The sphagnum moss consists mostly of absolutely unhumified hyaline leaves of different varieties, with a small amount of stems. These retain the bark-texture while the leaves are generally whole. Eriophorum vaginatum is less frequent.

As in the previous case, the sphagnum moss is little disintegrated, but on account of the large quantity of added wood fibres, it possesses greater strength. It is impossible to see the peat in the pasteboard with the naked eye; this can be distinguished only after microscopic investigation. It is noteworthy that the paper is of a light yellow color; foreign peat paper is always of a dark color.

It may be seen from the above data that the results of these tests were successful. However, owing to the great capacity which peat has for absorbing water, and the great expense entailed in removing the same, the experiments were not continued. This pasteboard was manufactured, according to Dr. Beddie's patent in Berlin.

The process is as follows: the raw peat is cleaned, first by mixing it in the machine with a weak solution of alcohol for removing the humus substance; it is then disintegrated in specially constructed machines and finally in most cases bleached. The bleaching process, it is claimed, is very difficult and costly

—much more so than in the case of wood fibre. Hence it has been shown that Sphagnum moss, even with the addition of a large amount of wood fibre, can not be used economically in the manufacture of paper.

Pasteboard manufactured by Engineer Ludwig Franz in Admont, Steiermark, is of a dark, grey-brown color, and is of several thicknesses. The thinnest quality had a tensile strength of 40 English pounds, weighed 400 grams per square metre, and was 0.54 mm. thick. Pasteboard 2.05 mm. thick had a tensile strength of 130 English pounds.

A. Cardboard: The surface is covered with minute fibres, which are not visible to the naked eye. The quantity of peat added is, in comparison, the same as in the Lindefors pasteboard. However, the Austrian sphagnum moss is more uneven than the Swedish; it is more humified and contains other kinds of peat residue, Eriophorum Vaginatum heather, and different kinds of carex. It seems that manufacturing was continued longer, which may be seen partly from the appearance of the cardboard and from the microscopic structure. Sphagnum leaves, humified to a certain degree, occur in smaller parts; unhumified pieces are often whole and hyaline (glass-like); the stems are very short and in many instances I have found the bark structure unfractured, the spirals of the absorption cells may also be very clearly noticed and even the spores of the sphagnum moss are well prseerved.

Eriophorum occurs in considerable amount and occasionally may be found as single fibres, but more often several fibres are gathered together in a flat, comparatively wide streak. Between the fibres occur parts of hyaline, epidermic, wave-shaped cell walls. The impurities found, consist of leaves of golden maidenhair, "Polytrichum commune," Jungermannia and some bark cells of heather, "Colluna vulgaris"; carex is found in the form of single, fine root branches. The fibres are composed chiefly of spruce and fragments of bark of the same plants are to be found. The fibres are bedded in pulp consisting of pith particles.

The sphagnum moss may also in this case be considered only as a filler, while the remaining peat substances, as for instance, eriophorum, heather, and carex, contain more or less of fibrous material, which contributes to the strength of the paper. Lumps without structure may be noticed, which, no doubt, originate from peat. These have no value, only making the paper dark and rendering the bleaching more difficult.

B. Pasteboard from the same place seems to be of the same composition as the above, the difference being so little that it is not worth while referring to it.

In 1902 a banker (Mr. Jellinks) and a few others started to manufacture paper at the factory in Admont, situated high up in the Steiermarks Alps. At the beginning the work was performed in an honorable manner, but later on

it was in operation only when the shareholders were expected to visit the plant. In 1904 it ended disastrously and the bank lost over a million kronor (1 kronor equals 27 cents).

In 1907 Engineer Ludo Franz started the operations anew, but shortly after he also was obliged to give up.

The situation of the factory was unfortunately chosen. The bog contained too little eriophorum peat. It was calculated that the wasted peat could be used as fuel, but on account of the heavy rainfall the drying was not successful. Lignite also proved to be an expensive fuel, but it was cheaper than using peat, even the peat litter factory employed lignite as fuel.

Thin paper, manufactured in October, 1897, by the firm, Karl A. Zschorner & Company, Vienna, contained, according to printed statements, 75 per cent. of peat. It had a tensile strength of 10 English pounds, had a weight of 105 grams per metre, and was 0.13 mm. thick.

The quantity of sphagnum moss is considerable, leaves mainly occur, which are usually disintegrated and dark in color. It may be noticed that the peat has not been fully humified; the particles of stems are rare, and when found the layer of bark structure is lacking.

Eriophorum occurs in a considerable amount. It is found partly as hyaline, epidermic, wavy-shaped cell walls, partly flat and sometimes in strips. The fibres are of a brownish color, and when enlarged 80 times it may be noticed that they are of a spiral shape and striped in a longitudinal direction with plainly visible cell walls at the ends.

The additional wooden substance is stated to be 25 per cent., but it seems to vary in different samples, sometimes being more. An inconsiderable quantity of pine and spruce pollen, heather-bark, leaves of mosses, and single, fine roots of carex is to be found.

Some of the paper is colored in different shades; reddish ,blue-grey, brown and yellow-brown; the two first mentioned colors have been exposed to daylight (not the sun) which made them fade on the outside.

Concerning the strength, it is, as mentioned above, only 10 English pounds, while the Munksjo pasteboard of the same weight has a strength of 60-65 English pounds. It is doubtful for what purpose this paper could be employed, as it is unsuitable for wrapping paper.

Zschorner started his manufacturing in 1895. He and two other manufacturers exhibited samples of peat paper at the World's Exhibition in Paris. Shortly after the firm became bankrupt and the two other manufacturers also failed during the same year.

Finally, I have also investigated a paper of English manufacture. The samples received here consisted of a series of postcards, partly colored and

partly auto-typed. The paper is loose and of the same grey brown color as the Admont paper. For this reason, the heading stating that the paper was manufactured from the old Irish soil from peat out of the Allan bog, could easily be believed. However, despite several investigations made by me, I was unable to find any peat substance in the paper. Usually all the samples from the other manufacturers contained considerable quantities of sphagnum moss, at least some vegetable substance was shown. Wooden and cotton fibres were principally found, consequently there is no peat, either as filler or fibre. If some of the dark, structureless lumps originate from intermixed peat, it could only add to the coloring of the paper; for the rest, the heading "Peat paper" is a fraud.

A short time ago Dr. Hallessy, of the Irish Geological Survey, stated in a letter to the Director, H. V. Feilitzen, that the manufacture of peat paper was discontinued four years ago. This will explain why the addition of peat in the paper is doubtful.

LIGNITE IN SASKATCHEWAN.

The extraordinary growth of the province calls for cheaper power and cheaper fuel, and this matter has been under consideration both publicly and privately for a very long time. The government decided last session to make an appropriation of $3,000 in order to obtain a report on the subject of producing power at the mines and distributing it throughout the province. The matter was given to Mr. A. J. McPherson, chairman of the Board of Highway Commissioners, who secured Mr. R. O. Wynne-Roberts to undertake the work. That gentleman immediately started to collect data as to what fuel was available and in what manner it was being consumed. He entered into correspondence with authorities in all parts of the world, so as to obtain the best information on the subject, and the report has now been handed in.

It will be apparent to the reader that the real development of Saskatchewan will in a large measure be dependent on the supply of cheaper fuel and power than is now available. At present about half a million tons of imported coal is being brought into the province from Western Canada and the States, and about 200,000 tons are being mined in the neighborhood of Estevan. About half of this goes to Manitoba towns; consequently the consumption of coal in the province amounts to about 600,000 tons, of which only 17 per cent. is of local production. Imported American coal costs anything from $8 to $13 per ton, and when it is borne in mind that the prosperity of the Eastern States of America is due to the low cost of fuel (for instance, it only costs $1 per ton in Pittsburgh), it is clear that industries are not possible without causing the production to be too high in price to compete with the imported article.

What is lignite? To understand what lignite is we must start with peat, which is the result of the decomposition of vegetable tissue in water when free from contact with air. Vegetation which is now found in swamps each year dies and fresh growth develops. In course of time the accumulation of vegetable matter assumes considerable thickness. Peat ranges in character from brown fibrous and friable matter to almost black carbonaceous matter. The next step in coal formation forms lignite which under pressure of superincumbent earth deposited through subsequent geological ages has been compressed, preserving in many cases its vegetable structure. In other cases, however, it is devoid of all signs of vegetation, when it is difficult to define the difference between it and bituminous coal. These two fuels belong to what geologists call the recent fossil age. The next kind of coal to be formed is bituminous, and finally we get the oldest coal, which is anthracite.

The next question is the value of the fuels for general use. Peat is used in many countries as domestic fuel and for the development of power, but as it usually contains from 80 to 90 per cent. of water it has to be air dried before it can be used with any degree of efficiency. Lignite also is used in some countries to a very great extent ; for instance Germany consumes eighty million tons per annum, and some of the German and Austrian cities use more lignite than any other kind of fuel. Up to the present the quantity of lignite used in North America is comparatively small, which is due to the fact that there is abundance of cheap bituminous coal, but of late years more attention has been drected towards the use of lignite.

According to the Canadian Geological Survey reports there is a large field of lignite extending southwards from Moose Jaw to Estevan in one direction and westwards to Wood Mountain in the other. This area is of a triangular shape and is reputed to contain 15,000 million tons. This figure, however, is undoubtedly conservative, as wells have been sunk near Estevan in which several layers of lignite have been found to a depth of 600 feet. There is another lignite field in Saskatchewan, which lies along the Alberta boundary commencing with a line drawn from Maple Creek towards Saskatoon and back to the Alberta boundary north of Macklin. This also contains a very large amount of lignite, but has unfortunately not been prospected to the same extent as the southern field.

Lignite is being used to generate power at the flour mills in Saskatchewan and Manitoba, on occasions at the electrical plants in Regina and Moose Jaw, and in connection with gas producers at Rouleau and Swift Current. Owing to the absence of reliable information as to the results obtained in consuming lignite for power generation Mr. Wynne-Roberts, with the authority of Mr. McPherson and the consent of Mr. Carpenter, deputy minister of public works, asked Mr. R. N. Blackburn, Wh. Sch., chief inspector of steam boilers, to undertake scientific and practical tests. These tests were made at Estevan and

Weyburn. Full particulars are given in the report, but it may here be pointed out that the net heating power obtained in steam power was only about 50 per cent. of that contained in the coal. In ordinary practice 70 per cent. is recognized to be good, and Mr. Wynne-Roberts in his reports points out that if 70 per cent. of heat value is worth, say, $100, fifty per cent. efficiency is only worth $70, so that there is a loss of $30 in every hundred. Information has been received showing that 70 per cent. efficiency has been secured with lignite in some German plants. It is therefore evident that it is worth an effort and some expenditure to secure better efficiency.

The Canadian government carried out some tests at McGill University in 1908, both with steam power and gas producers. The United States Bureau of Mines also carried out a large number of tests at St. Louis and at Pittsburg. There are a large number of plants in actual operation in Texas, which by the way is the largest consumer of lignite in North America. The average results of all these tests demonstrate that it is quite possible to develop one brake horse power by means of gas producers and engines for the consumption of about three pounds of lignite, but to obtain the same power by steam it is necessary to consume about three times as much. It is therefore apparent that lignite is better adapted for use in gas producers than in steam boilers.

Another use made of lignite is in the manufacture of gas in large quantity. Many experiments have shown the possibility of making gas from lignite suitable for general use. This is done by means of the ordinary gas works plant, but the coke residue from the coal cannot without treatment be utilised. It can, however, be made into briquettes and excellent fuel is by this means to be obtained. Experiments have also been made in this direction in Texas; Ann Arbor, Mich.; at St. Louis, Mo.; at Speccia, Italy, and at Teplitz, Austria, which are confirmed by the results obtained in North Dakota.

There is no doubt that by adopting suitable appliances for consuming lignite it can be used for the development of power. Lignite being so different from coal in that it contains so much volatile matter and water and much less carbon it must evidently be used in a different manner. The Germans have evolved special furnaces for this fuel to raise steam, and they have adapted a number of gas producers for gasifying the lignite. This aspect of the use of lignite is set forth in the report in a chapter of great length. Mr. Wynne-Roberts has submitted several schemes for the generation of power at large central power stations located at the lignite mines, with copious figures showing the estimated cost of installing and working the same. These estimates are based on the first instalment of 10,000 h.p. It is, of course, impossible to review these figures here, but the general results indicate that it is quite possible to develop and transmit power to a large number of our towns at a rate much below what now obtains. (The Public Service Monthly, Regina, Dec., 1912).

FUEL OIL AND ITS EFFECT ON TRANSPORTATION COSTS.

Fuel oil is effecting changes in both land and sea transportation that are little short of revolutionary. Coal locomotives have given place to oil locomotives on the Rocky Mountain division of the Canadian Pacific, and Southern Pacific is using them extensively, as is also Atchison. In short most of the big railroads tapping oil territory have found oil more economical for fuel than coal.

The economy in use of oil is more than mere economy of fuel cost. It is estimated that a modern steamship of the size of the large Cunarder, for instance, would be able to dispense with more than 200 firemen if fuel oil engines were substituted for turbines, and that the 5000 tons of coal required for a five-day trip across the Atlantic could be replaced with fuel oil that could be stored in the double bottom of such a vessel, thereby affording additional freight room. So far as cost is concerned, it is estimated that coal would have to be supplied at 40 cents per ton to equal current cost of fuel oil.

The Hamburg-American liner Christian X, a ship of 10,000 tons displacement burning fuel oil, on recent trip from Hamburg to New York, maintained an average speed of 11 knots per hour and is expected to attain 13 knots. She can stow 1000 tons of oil in her double bottom, but required on an average only 10 tons per day. It is claimed that this vessel can carry 1000 tons of freight more than one of similar size equipped with ordinary engines and can be operated at a saving of $50,000 a year.

PEAT DEVELOPMENT IN RUSSIA.

"The high price of oil, which has reached one cent per pound in Moscow, has obliged consumers to use every effort to find a substitute or limit consumption. For instance, the Sormove works which had increased their consumption of liquid fuel from 2,000,000 poods to 3,176,000 poods (36,112 to 57,346 short tons) per year, have again limited the consumption to 2,000,000 poods, and at the same time are developing the production of peat, buying wood, etc. They are said to have purchased about 260,000 acres of government land, on which they will produce peat and construct gas works and an electric station.

The Moscow Electric Co., which consumed 2,500,000 poods (45,140 short tons) of oil in 1911, has purchased an extensive area of peat with improved machinery.

The supply of peat in the Central Provinces is immense, and there is no cause for apprehension that it will prove insufficient."—U.S. Consular Report.

AMMONIUM SULPHATE IN CHINA.

Sulphate of ammonia is used in the Amoy district of China principally for fertilizing rice and sugar-cane fields. It is said to have four times the strength of the Manchurian bean cake, extensively used, and to cost but three times as much which, taken together with the added facility of application, creates a growing market.

In 1903 a trial shipment of 40 catties (53 lbs.) was received at Amoy.

The imports for 1911 were 7,000 long tons and up to October 31, the imports for 1912 amounted to about 9,000 long tons.—U.S. Consular Report.

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EDITORIAL.

On page 23 et seq. will be found a continuation of the tabulated statement of retail prices of fuel in Canada for a period of three years. This table shows in a clear manner the general rise of prices throughout the country. In many districts in the older settled portions the supply of wood has almost disappeared.

On page 26 appears a reprint of the table of Analyses of Peat Samples published in the February issue of the Journal. In the report from which the table was taken an error occurred in transposition of the figures for nitrogen and phosphorus in the last five samples. The table is reprinted for the purpose of correcting this error.

A Joint Convention of tbe American and Canadian Peat Societies will be held in Montreal on August 18, 19 and 20. A number of important papers will be presented, and the meeting is expected to be of unusual interest. The programme will include visits to the peat fuel plants now in operation at Alfred, Ont., and Farnham, Que. These are the largest peat fuel plants actually working on the continent, and owing to the improved methods of production which have been inaugurated a visit to these plants will prove of very great interest to all who are in any way concerned in the development of the peat industry at Alfred. There is installed a new Anrep mechanical excavator, a cable-way for handling the raw peat and depositing it on the drying ground, a new spreading device and other improvements of great interest. Members and friends of both Societies and all others interested in peat are cordially invited to be present. For programme and further information address the Secretary of this Society or Julius Bordollo, Secretary American Peat Society, Kingsbridge, New York City.

In the February Journal reference was made to the investigation of peat power plants in Europe under direction of the Mines Branch by Mr. B. F. Haanel, Chief of the Fuel Testing Division, assisted by Mr. John Blizard. A comprehensive report of the results of this investigation is now in course of preparation and will be issued shortly as a Bulletin of the Department of Mines. The information is not yet available for publication in the Journal, but it is understood that the forthcoming report will contain much valuable data on the subject of utilization of peat deposits for the development of cheap power.

PROGRESS OF THE PRODUCER-GAS ENGINE.

At the Ford works in Detroit there is being installed the most powerful producer-gas engine yet built in any country. The engine was built at Hamilton, Ohio, by the Hooven, Owens, Rentschler Co. There are four double-acting cylinders, 42x72 ins., two in tandem on each side. The engine is designed to run at 85 r.p.m. or 1020 ft. of piston speed. Its length is 73 feet and its over all width 32 feet. The generator is capable of carrying a 25 per cent. overload, and the engine has acapacity of 5000 i.h.p.

The United States Steel Corporation are putting in a number of large gas engines at Gary, Ind., as are also the Maryland Steel Co. at Sparrows Point, Md.—"Power."

Mr. Anrep, of the Mines Branch at Ottawa, is here to survey the peat bogs of P. E. Island and report as to their utility as sources of heat. His visit will be welcomed, and the results will be interesting to many persons in view of the continuously increasing cost of coal and the continually decreasing area of our wood lands.—Charlottetown Examiner.

PATENTS RELATING TO PEAT ISSUED BY THE CANADIAN PATENT OFFICE.

Patent No. 170663 (Dec. 7th, 1912).

T. Rigby, Dumfries, Scotland.

(Assigned to The Peat Coal Investment Co., Limited).

Getting or Excavating Peat.

The invention relates to the gathering of peat, and has for its object to ensure continuity of supply of peat from the bog to the locality at which it is being employed, *e.g.* peat carbonizing apparatus situated near the bog, independently of cold winter temperatures, which result in freezing the bog or deposit.

An excavation of the bog or deposit, of limited size, but of capacity to contain a supply of peat sufficient for the cold period is kept distinct from the main excavation of the bog, and is used to contain a sufficient quantity of the peat for the normal working of the period, the excavation being of such depth that freezing cannot under ordinary cold conditions occur to excessive extent.

The peat collected from the main area of the bog is finely macerated, and then conveyed by pipe line to the storage area. In the latter is placed a dump pit, from the bottom of which the macerated peat may be pumped during the cold period, and conveyed by pipe line, situated in a covered trench, to the factory.

Owing to the fact that peat is an extremely bad conductor of heat, freezing of the store area occurs only superficially, and by carrying the pipe line below the frozen surface, pumping of the mass to the factory may be carried on continuously. It is stated that peat which has been excavated and disintegrated to such an extent that its fibrous structure is destroyed, so that it is possible to pump it, forms a fluid slimy mass from which the solid matters do not settle.

Claims:—

1. A method for ensuring continuity of working in a peat installation by excavating the peat from the bog and conveying it hydraulically, in which the peat is, immediately after its excavation, disintegrated, and is supplied to a store area of sufficient depth to prevent any but superficial freezing, and of sufficient size to permit of uninterrupted working during the cold season, and is conveyed therefrom to the desired locality as required through a pipe line having its intake below the level at which any freezing may occur, as set forth.

2. In a peat deposit in combination a store excavation, a working excavation, means for excavating peat in said working excavation, means supplied therefrom for disintegrating and finely macerating the peat and means supplied by said latter means for conveying hydraulically the disintegrated peat to the store ex-

cavation, together with means adapted to take peat from below the surface of the store of peat and for conveying the same to the desired locality, as set forth.

3. In a peat gathering installation on a peat deposit an excavation, means separating off a part of said excavation, said separated portion being of a sufficient depth to prevent more than partial freezing of material contained therein under cold season conditions, means in said separated portion for withdrawing peat contained therein from the lower part thereof as desired, and means on the other part of said excavation adapted to gather peat and supply it to said separated area as set forth.

4. In a peat gathering installation on a peat deposit a main excavation, a further excavation separated therefrom and of a sufficient depth to prevent more than partial freezing thereof under cold season conditions, means in said main excavation for gathering peat, means for macerating peat directly supplied by said gathering means, pumping means supplied thereby, and a pipe line connecting said pumping means to said further excavation, together with means for drawing off macerated peat from the lower part of said excavation and supplying it to the desired locality, as set forth.

No. 146958. (April 1, 1913).

Nils Testrups and Olof Soderland of London, Eng.
Removal of water from wet-carbonized peat.

The removal of water from wet-carbonized peat presents certain difficulties.

By ordinary filtration the water content is reducible only to about 90%.

By employing a pressure of 100 lbs. to the square inch for forcing the peat into the filtering chamber, the water has been reduced only to 66%.

To further reduce the water content greatly increased pressure is required and serious difficulties arise in ensuring even distribution of the pressure and in providing apparatus, strong and large enough to deal with the great quantities of material to be handled in practice.

Various attempts to accomplish this by special apparatus have been unsuccessful. A press of the type having laminated walls, and a screw feeding member, and having a restricted orifice failed, owing to the spaces between the laminae becoming choked, and the plug formed at the restricted orifice being forced out, allowing free passage of the material under treatment.

An apparatus comprising a reciprocating plunger pump with an open ended cylinder intended to be closed by a plug of the material and filtering means around the cylinder, the peat being forced into the cylinder has also been a failure.

The relatively high speed of the plunger resulted in the first place in no filtration, owing to the elasticity of the material, and the plug was blown out, giving free passage to the material.

The object of this invention is to overcome these difficulties. It has been observed that when the percentage of water in the press cake in the filter press falls to about 70%, the material loses its plasticity or fluidity. The pressure is then highest near the inlet of the peat to the apparatus (the point of application of the pressure) and diminishes as the distance from the inlet increases. Increase of pressure beyond about 100 lbs. to the square inch, is practically useless, as it results in a rupturing of the press cake and the formation of channels through which filtration proceeds without further drying action on the cake already formed.

In the new process the peat passes from the receiver attached to the carbonizer into a filter press in which a pressure of from 100 lbs. to 150 lbs. to the square inch is employed. As the press cake must be removed from the filter press after about 25 minutes operation, two or more presses are used with means to cut off the supply to one in order that it may be emptied while another is in use.

The material is then conveyed to a press of the band press type so constructed as to be capable of giving a gradually applied and high pressure. The strong perforated endless bands are placed closer together as they approach the far end of the press so that the material receives a constantly increasing pressure, the liquid passing away through the perforations of the links of the bands. The final pressure may amount to about 600 lbs. to the square inch, and the band press must be so constructed as to give a very high pressure without undue friction.

In the first stage of the process filtration is brought about through keeping up pressure by pumping more fluid into a chamber of constant volume, (in the filter press); in the second stage the size of the confining chamber is reduced as the water is extracted (in the band press).

The material as it leaves the band press is said to contain about 50% water and to be suitable for direct use in a gas producer, preferably an ammonia recovery producer, for which it is claimed to be particularly suitable or it may be broken down and dried by artificial heating down to about 5 to 15% moisture and then heated for briquetting.

The following detailed example of the working of the method is given:—

"In a factory in which 86 tons of peat, containing about 90% water (equal 8.6 tons of dry peat) was carbonized per hour, which peat was changed to such an extent in the oven that only 6.9 tons of dry peat substance remained admixed with the liquid, in order to reduce the water content of the material to the neighborhood of 70% moisture, seven filtering presses containing 10,000 sq. ft. of filtering surface were required. By using these filtering presses intermittently and in regular rotation, it was possible to reduce the water as low as 67% by weight when using a pressure corresponding to 120 lbs. per sq. in.

maximum. 25 minutes approximately were taken to reduce the water content from 92% to 67%, the pressure in the interior of the filter presses being gradually increased from little or nothing to 120 lbs., which maximum was kept on for 15 minutes and was necessary to reduce the liquid content to about 70%. It became practically impossible to reduce the water content below about 70% by means of the filter presses. External pressure was then applied in a band press having 60 sq. ft. of pressing surface, and having a final pressure of about 600 lbs. per sq. in., the time occupied in the band press being about 42 seconds.

Claims.

1. A process for the treatment of peat, including subjecting the same to wet carbonization in which high pressure is generated in the material, utilizing the said pressure to remove the bulk of the liquid matter, and separating a further quantity of liquid by sustained external pressure ,as set forth.

2-4. Further process claims.

5-8. Claims on apparatus.

HEAT VALUE BY CALCULATION.

The combustion of a given element always results in the generation of a fixed amount of heat. Thus, when a pound of pure carbon burns completely (forming CO_2) 14,600 B. t.u. is produced. When 2 lb. is burned, 29,200 B. t. u. is generated, and so on. Consequently, the heat value of carbon is said to be 14,600 B. t. u.—which means 14,600 B. t. u. per lb., as the pound is the unit of weight almost universally used in this country.

When a pound of pure carbon burns incompletely (forming CO), only 4450 B. t. u. is produced. But if, in turn, the resulting 2 1-3 lb. of CO, which is a combustible gas, is burned, 10,150 additional B. t. u. is liberated, making the total heat produced equal to 14,600 B. t. u., just the same as though the pound of carbon had burned completely (to CO_2) in the first place. Hence, the heat value of CO is

$$\frac{10.150}{2.333} = 4350 \text{ B t u. per lb.}$$

The heat value of pure hydrogen is 62,000 B. t. u. per lb.

These heat values for carbon and hydrogen were established by experiment and hence probably are not absolutely exact. In fact, some authorities give values for carbon as low as 14,220 and as high as 14,647, and for hydrogen as low as 61,816 and as high as 62,032, but as the ones given (14,600 and 62,000) are the most widely accepted and used, it is best to accept them for use in our work

The heat value of sulphur, the only other heat-producing element in the common fuels, is 4050 B. t. u. per lb. While this fact is interesting, it is not important in practical work, because, in addition to the heat value of the sulphur itself being low, the percentage of sulphur in the average fuel is also low; besides, the sulphur may not be pure and hence may have no heat value whatever. Thus the amount of heat due to the sulphur is very small compared with that given by the two main elements, carbon and hydrogen.

To estimate the heat value of a pound of fuel containing both carbon and hydrogen, simply multiply the percentage of total carbon in the fuel (expressed as a decimal) by 14,600, the percentage of available hydrogen (also expressed as a decimal) by 62,000 and add the results together.

To illustrate, assume we wish to estimate the heat value of a coal with this analysis:

Carbon 68.12 per cent.; hydrogen 4.98 per cent.; oxygen 7.42 per cent.; nitrogen 1.98 per cent.; sulphur 4.54 per cent.; ash, 12.96 per cent.

The heat due to the carbon is

$$0.6812 \times 14{,}600 = 9{,}945.5 \text{ B.t.u.}$$

The available hydrogen equals

$$0.0498 - \frac{0.0742}{8} = 0.0405$$

and this, multiplied by the heat value of hydrogen,

$$0.0405 \times 62{,}000 = 2{,}511 \text{ B.t.u.}$$

the heat due to the hydrogen in the coal. The sum of these two quantities is

$$9{,}945.5 + 2{,}511 = 12{,}456.5 \text{ B.t.u.}$$

the heat value of the coal.

HEAT VALUE BY FORMULA.

The foregoing method can be expressed in a formula as follows:

$$C \times 14{,}600 + \left(H - \frac{O}{8}\right) 62{,}000 = \text{B.t.u. per lb.}$$

where

C = Decimal part by weight of carbon in the fuel;
H = Decimal part by weight of hydrogen in the fuel;
O = Decimal part by weight of oxygen in the fuel.

To apply this formula to another example, assume a coal with this analysis: Carbon 65.23 per cent.; hydrogen 4.95 per cent.; oxygen 1.485 per cent.; nitrogen 1.66 per cent.; sulphur 2.10 per cent.; ash 11.21 per cent. Substituting in the formula, we have

$$0.6523 \times 14{,}600 + \left(0.0495 - \frac{0.1485}{8}\right) 62{,}000 = 11{,}439 \text{ B.t.u.}$$

The foregoing method or formula may be used for any other kind of fuel or for oil, wood, gas, etc. In dealing with gas, however, care must be used that volumes and weights are not confused to produce error. A common method of stating the heat value of a fuel gas is in B. t. u. per cubic foot or per 1000 cu. ft. In such cases the temperature and pressure of the gas must also be specified because these influence the volume greatly. The temperatures most frequently taken are 32 and 60 deg. F., and the pressure, 14.7 lb., absolute.—"Power."

HEAT VALUE OF PEAT FUEL.

In forming an estimate of the comparative heat value of peat fuel the customary method of basing same on the ultimate analysis of the fuel is misleading and does not fairly represent the fuel value of the peat. E.g. in Vol. 1, No. 2 of the Journal at page 13 appears the ultimate analysis of peat used at Portadown, Ireland, as follows:—

Carbon	44.60
Hydrogen	5.42
Nitrogen	0.97
Ash	1.10
Moisture	18.98
Oxygen (by diff)	28.93
	100.00

Theoretically one and a half tons of this peat would equal in value the above coal containing 11.439 B. t. u.

In practise the heat value of the peat is much higher comparatively than these figures would indicate, owing to the fact that more perfect combustion of the peat than of the coal will be obtained under working conditions.

As above pointed out, a lb. of carbon giving 14,600 B. t. u. when completely burned (giving CO_2) gives only 4450 B. t. u. when burned incompletely (forming CO).

Actual heating results obtained therefore depend to a very great extent on the completeness of combustion.

Not only is there a large waste of the heat value of many coals due to loss of gases containing unburned carbon, but with the lower grades of coal especially, considerable amounts of unconsumed carbon are carried off in the form of smoke. Peat burned under proper conditions is practically smokeless, and the loss of unconsumed carbon in gases formed is small, owing to more complete combustion.

QUANTITY OF AIR REQUIRED.

Peat burns with a much smaller air supply than coal, and this directly affects heat losses, through the necessity of employing a greater draft to burn coal. A recent article in "Power" states:—

"The total loss in the dry chimney gases (in burning coal for steam generation) in best practice averages 25 per cent. of the total heat generated from the fuel, calculated as follows:—

"Assume the air supply to be theoretically correct proportioned to the amount of coal burned, i.e. 11.5 lbs. per lb. of combustible; atmospheric temperature, 60 deg. F.; stack temperature at the base 450 deg. F.; specific heat of the flue gases, 0.24. Then the heat carried away by the least possible weight of chimney gases with perfect combustion and the conditions specified above would be

$$(11.5 + 1) \times (450 - 60) \times 0.24 = 1170 \text{ B.t.u.}$$

with fuel having a calorific value of 12,500 B. t. u. per lb., this means an unavoidable loss of

$$\frac{1170}{12,500} \times 100 = 9.36 \text{ per cent.}$$

The remaining 15.64 per cent. loss is due to the excess air necessary for complete combustion."

UNIFORMITY OF PRODUCT.

Another element of much practical importance is the greater uniformity of product. Machine peat made by modern approved methods, should be practically uniform in quality from a given bog. Peat from different bogs will of course vary in quality. Coal which shows a high B.t.u. from analysis of selected samples may be so mixed with slate and other impurities as to give poor results. So that while tests of clean coal may shew a fuel of high grade, the heating value of the entire cargo from which it is taken may be much lower.

LOSS OF FUEL THROUGH GRATES

In the burning of coal under ordinary conditions, a high percentage of the fuel value is often lost in the form of fine coal, clinkers and ash shaken through the grates, in order to keep the fires open to air supply.

The loss on this account in burning of peat is vastly less. Requiring less draft it does not need frequent shaking. Combustion being practically perfect no clinkers are formed, the only residue being a very fine ash which drops through the openings in the grate-bars.

RETAIL PRICES OF FUEL IN CANADA.

(Continued from February Journal).

The following tables set forth the retail prices prevailing on, or about, the fifteenth of each month from May, 1910, to December, 1912, inclusive, of coal and wood in the leading centres of industry throughout Canada.

The list of localities includes nearly every place having a population of 10,000 people, and is representative of every Province in the Dominion.

The quotations were furnished to the Department of Labour by the correspondents of the Labour Gazette in the respective localities, under detailed instructions from the Department as to sources of information, quality of goods to be quoted, etc., and have been compiled from the table of Retail Prices of Staple Articles of Consumption, published monthly in the Labour Gazette.

The prices quoted are per ton of 2,000 lbs. of coal, and per cord of wood.

Abbreviations:—H.C.—Hard Coal (Anthracite).

S.C.—Soft Coal, (Bituminous, in some cases in the Western Provinces, Lignite).

H.W.—Hard Wood.

S.W.—Soft Wood.

RETAIL PRICES OF FUEL IN CANADA—*Continued.*

	WINNIPEG, MAN.				BRANDON, MAN.				REGINA, SASK.				SASKATOON, SASK.			
	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.
1910																
May	10.50	9.00	6.00	—	11.25	9.00	6.25	4.75	12.50	8.50	8.00	7.75	—	—	—	—
June	"	"	"	5.00	"	"	6.75	"	"	"	"	7.25	—	—	—	—
July	"	"	"	"	"	"	"	"	"	"	"	"	—	—	—	—
August	"	"	"	"	"	"	"	"	"	"	"	"	—	—	—	—
September	"	"	7.50	6.00	"	"	"	"	"	"	"	7.75	—	—	—	—
October	"	"	"	"	"	"	6.00	5.00	"	6.50	"	"	—	—	—	—
November	"	"	"	"	11.50	"	6.75	4.75	13.00	8.50	"	"	15.00	9.50	—	7.00
December	"	"	"	6.50	"	"	"	"	"	"	"	"	—	—	—	—
1911																
January	"	"	"	"	—	—	—	—	"	"	"	"	—	—	—	—
February	"	"	7.25	5.75	—	—	—	—	13.50	"	9.00	8.50	15.00	9.50	—	7.00
March	"	"	7.00	5.50	11.25	9.00	7.60	5.00	"	"	"	"	—	—	—	—
April	"	"	6.50	5.75	"	"	6.75	4.75	"	"	"	"	15.00	9.50	—	7.00
May	"	"	6.75	"	"	"	"	"	"	"	"	"	—	—	—	—
June	"	"	"	"	"	"	"	"	"	"	"	"	—	—	—	—
July	"	"	"	"	"	"	"	"	"	"	"	"	—	—	—	—
August	"	"	"	6.00-7.25	"	"	"	"	"	"	"	"	—	—	—	—
September	"	"	7.25	6.00	"	"	"	"	"	"	"	"	—	—	—	—
October	"	"	7.00	"	11.75	"	"	"	12.50	10.00	"	"	—	—	—	—
November	"	9.50	"	"	11.25	"	7.00	5.00	"	"	"	"	—	—	—	—
December	"	"	"	"	"	9.25	9.00	6.00	"	"	"	"	—	—	—	—
1912																
January	"	9.00	8.00	"	11.50	"	8.00	5.50	"	"	"	"	—	—	—	—
February	"	"	"	"	"	"	"	"	"	"	"	"	13.50	7.50-8.50		6.50
March	"	"	"	"	"	"	"	"	"	"	"	"	"	"	7.00	5.00-6.00
April	"	"	7.50	"	"	"	"	"	"	"	"	"	"	"	"	6.00
May	"	"	"	5.50	"	"	"	"	"	"	"	"	"	"	7.50	5.50-6.50
June	"	"	7.00	"	"	"	"	"	"	"	"	"	"	8.50	"	6.50
July	"	"	"	6.00	"	"	"	"	"	"	"	"	"	"	7.00	"
August	"	"	"	5.50	"	"	"	"	"	"	"	"	"	"	7.50	6.50-7.00
September	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	6.50
October	11.00	"	"	"	"	"	7.50	"	"	"	"	"	14.00	10.00	"	"
November	"	"	7.50	6.00	11.75	9.50	8.75	6.75	"	"	"	"	"	"	"	"
December	"	"	"	"	"	"	"	"	13.25	"	"	"	"	"	"	"

RETAIL PRICES OF FUEL IN CANADA—*Continued.*

	MOOSE JAW, SASK				CALGARY, ALTA.				EDMONTON, ALTA.				LETHBRIDGE, ALTA.			
	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.
1910																
May	13.50	8.00	—	9.00	8.00	6.50	—	5.50	—	3.50	—	3.00	—	—	—	—
June	"	"	—	9.50	"	"	—	—	—	"	—	3.50	—	—	—	—
July	"	"	—	"	"	5.50-6.00	—	—	—	"	—	3.00	—	—	—	—
August	"	"	—	"	8.50	6.50-6.75	—	—	—	"	—	"	—	—	—	—
September	12.50	"	—	"	"	"	—	—	—	"	—	"	—	—	—	—
October	13.50	"	—	"	"	"	—	—	—	3.50-4.00	—	"	—	—	—	—
November	"	"	—	"	"	"	—	—	—	"	—	"	—	—	—	—
December	"	"	—	"	"	6.25-6.75	—	—	—	4.00	—	"	—	—	—	—
1911																
January	—	—	—	—	"	"	—	—	—	"	—	"	—	—	—	—
February	—	—	—	—	"	"	—	—	—	3.75	—	"	—	—	—	—
March	—	—	—	—	8.25	"	—	—	—	3.50	—	"	—	—	—	—
April	—	—	—	—	850	5.50	—	—	—	"	—	"	—	5.25	—	—
May	—	—	—	—	"	"	—	5.75-7.00	—	"	—	"	—	6.50	—	—
June	—	—	—	—	"	"	—	"	—	4.00	—	"	—	5.50	—	—
July	—	—	—	—	"	"	—	"	—	"	—	"	—	"	—	—
August	—	—	—	—	13.50	6.50	—	"	—	"	—	"	—	6.00	—	—
September	—	—	—	—	—	—	—	—	—	"	—	"	—	"	—	—
October	—	—	—	—	—	—	—	—	—	5.00	—	3.50	—	6.50	—	—
November	—	—	—	—	—	—	—	—	—	"	—	"	—	7.00	—	—
December	—	—	—	—	—	—	—	—	—	—	—	—	—	5.00	—	—
1912																
January	—	—	—	—	13.50	575-7.00	7.00	5.75	—	—	—	—	—	4.50	—	—
February	—	—	—	—	—	—	—	—	—	—	—	—	—	"	—	—
March	—	—	—	—	—	—	—	—	—	4.50	—	3.00	—	"	—	—
April	—	—	—	—	—	—	—	—	—	"	—	3.50	—	"	—	—
May	—	—	—	—	—	—	—	—	—	"	—	"	—	"	—	—
June	—	—	—	—	7.00-8.75	6.75	6.75	5.50-8.50	—	4.00	—	"	—	"	—	—
July	—	—	—	—	"	"	"	"	—	"	—	"	—	"	—	—
August	—	—	—	—	"	"	"	"	—	"	—	"	—	5.00	—	—
September	—	—	—	—	"	"	—	—	—	"	—	"	—	"	—	—
October	—	—	—	—	"	"	—	—	—	4.50	—	"	—	"	—	—
November	—	—	—	—	—	—	—	—	—	5.00	—	"	—	"	—	—
December	—	—	—	—	—	—	—	—	—	4.75	—	"	—	"	—	—

RETAIL PRICES OF FUEL IN CANADA—*Continued.*

	NELSON, B.C.				NEW WESTMINISTER, B.C.				VANCOUVER, B.C.				VICTORIA, B.C.			
1910	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.	H.C.	S.C.	H.W.	S.W.
May	9.50-10	7.00-8.25	—	6.00	—	7.75	—	5.00	12.50	7.50	—	5.00	—	6.50-7.50	—	4.50
June	"	"	—	"	—	"	—	"	—	"	—	3.00-3.50	—	—	—	6.50
July	"	"	—	"	—	"	—	"	—	"	—	3.00	—	—	—	6.00
August	"	"	—	"	—	"	—	"	—	"	—	4.00	—	—	—	—
September	"	"	—	"	—	"	—	"	—	"	—	5.00	"	"	—	"
October	"	"	—	"	—	"	—	"	—	"	—	4.50	11.50	6.50-7.50	—	—
November	"	"	—	"	—	"	—	"	"	"	—	"	"	"	—	6.00
December	"	"	—	"	—	"	—	"	—	"	—	5.00	"	"	—	"
1911																
January	"	"	—	"	—	"	—	"	—	"	6.00	3.50	"	"	—	7.00
February	"	"	—	"	—	"	—	"	—	"	—	5.50	"	"	—	6.00
March	"	"	—	"	—	"	—	"	—	"	—	"	"	"	—	"
April	"	"	—	"	—	"	—	"	—	"	—	"	"	"	—	"
May	"	"	—	"	—	"	—	"	—	"	—	"	"	"	—	"
June	"	"	—	"	—	"	—	"	—	"	—	"	"	"	—	"
July	"	"	—	"	—	"	—	"	—	"	—	"	"	"	—	"
August	"	8.00-12	—	"	—	"	—	"	—	"	—	"	"	"	—	"
September	"	"	—	"	—	"	—	"	—	"	—	"	"	"	—	"
October	"	"	—	"	—	8.00	—	6.50	—	"	—	"	"	"	—	"
November	8.50-12.50	9.50	—	"	—	10.50	—	"	—	8.00	—	6.00	"	"	—	"
December	9.50-17	7.50-12	—	"	—	8.00	—	"	—	"	—	5.50	"	"	—	"
1912																
January	12.50	8.75	—	6.50	—	"	—	"	—	—	—	—	"	"	—	"
February	12.00	"	—	—	—	"	—	"	—	—	—	—	"	"	—	"
March	"	"	—	6.50	—	"	—	"	—	—	—	—	"	"	—	"
April	"	"	—	"	—	"	—	"	—	—	—	—	"	"	—	"
May	"	"	—	"	—	"	—	"	—	—	—	—	"	"	—	"
June	"	"	—	"	—	"	—	"	—	—	—	—	"	"	—	"
July	"	"	—	"	—	"	—	"	—	—	—	—	"	"	—	"
August	"	"	—	"	—	"	—	"	—	—	—	—	"	"	—	"
September	"	"	—	"	—	"	—	"	—	—	—	—	"	"	—	"
October	"	"	—	"	—	"	—	"	—	—	—	—	"	"	—	"
November	"	"	—	"	—	"	—	"	—	7.50-7.75	—	—	"	"	—	"
December	"	"	—	"	—	"	—	"	—	7.50-8.00	—	—	"	"	—	6.50

The Following Table Shows the Analyses from the Different Peat Samples Collected in Ontario.

No. of Samples from each Bog	Peat from	Composition of Peat.	ANALYSES OF PEAT (absolutely dry).						
			Volatile matter	Fixed Carbon	Ash	Phosphorus	Sulphur	Nitrogen	Calorific value, B. T. U. per lb.
1	Mer-Bleu, Ontario	Sphagnum more or less mixed with eriophorum	65.90	24.22	10.88	----	-	-	8821
2	" "		67.57	25.35	7.18	0.026	0.314	1.40	9021
3	" "		68.40	25.00	6.60	----	--		
4	" "		63.22	24.86	11.92	----	----	-	8805
5	" "		68.76	25.73	5.51	----	--	-	9126
6	" "		68.73	26.27	5.00	0.024	0.317	1.13	9441
7	" "		69.49	26.04	4.47	----	----		9301
1	Alfred, Ontario	Principally formed by sphagnum	68.13	26.56	5.31	0.029	0.292	1.23	8730
2	" "		68.72	24.22	7.06	0.022	0.375	1.42	9058
1	Welland, Ontario	Sphagnum mixed with carex, eriophorum, and hypnum	67.14	26.48	6.38	0.027	0.317	1.13	9118
2	" "		70.90	24.84	4.26	0.024	0.248	1.74	8506
3	" "		70.53	24.28	5.19	----	-		8667
1	Newington, Ontario	Sphagnum slightly mixed with aquatic plants.	66.75	25.77	7.48	0.028	0.530	1.85	8721
2	" "		67.07	26.27	6.66	0.030	0.494	1.80	8465
3	" "		68.84	26.65	4.51	----	- -		8877
4	" "		71.32	24.44	4.24	0.032	0.345	1.43	8336
5	" "		69.54	26.75	3.71	----			9102
6	" "		65.77	27.30	6.93	----	-		8210
7	" "		66.97	26.70	6.33	----	----	----	8312
1	Perth, Ontario	Sphagnum mixed with hypnum.	70.34	25.35	4.31	0.030	0.405	1.66	9067
2	" "		71.51	24.60	3.89	0.027	0.334	1.94	9148
1	Victoria Road, Ontario	Hypnum mixed with sphagnum.	69.52	25.18	5.30	----	-	-	8649
1	Brunner, Ontario	Principally hypnum	64.09	25.16	10.75	0.035	0.303	1.73	8850
1	Komoka, Ontario	Sphagnum mixed with carex	60.90	18.52	20.58	0.087	1.34	1.63	7490
1	Brockville, Ontario	Carex slightly mixed with eriophorum and aquatic plants.	66.70	21.75	11.75	0.038	0.90	2.41	8173
1	Rondeau, Ontario	Carex mixed with remains of grasses and aquatic plants.	61.00	22.90	16.10	0.049	0.73	2.77	7914
1	Alfred, Ontario: part of bog.	Sphagnum slightly mixed with hypnum and eriophorum.	68.23	26.00	5.77	0.033	0.218	1.76	9005

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Journal of the Canadian Peat Society

Vol. 2 AUGUST, 1913 No. 3

JOINT MEETING OF CANADIAN AND AMERICAN PEAT SOCIETIES.

Held at Montreal, August 18, 19, and 20, 1913.

In order that members of both Societies might have an opportunity of seeing the peat fuel plants at Alfred, Ont., and Farnham, Que., in course of regular operation, an invitation was extended by the Canadian Peat Society to the Executive of the American Peat Society to hold their Seventh Annual Meeting in the City of Montreal. This invitation was duly accepted and the date of the meeting fixed for August 18th, so as to take place well before the close of the season for active work in making peat fuel. By courtesy of the Canadian Society of Civil Engineers the sessions were held in their splendid new rooms on Mansfield street, the fine audience hall and reading rooms being made free to the Peat Societies during the meeting. Although the attendance, owing to the date of the meetings was not large, much enthusiasm was displayed by the representative body of members present and a most interesting program was presented.

MORNING SESSION, AUGUST 18th.

The meeting opened at 10 a.m., with Mr. Carl Kleinstueck, of Kalamazoo, Mich., in the chair. After the opening formalities papers were read as follows:

Utilization of Peat in Agriculture as a substitute for Manure, by Mr. John N. Hoff of New York, President of the American Peat Society.

The Full Meaning of Moisture in Peat, by Mr. Robert Ransom, of Pablo, Florida .

A Contribution to the History of Peat, by Dr. Herbert Philipp, of Perth Amboy, N.J.

Peat in Agriculture, by Prof. W. R. Beattie of St. Louis, Mo.

Peat Moss: Some of its uses, its manufacture, and its future on this continent, by W. F. Todd, of St. Stephens, N.B.

Brief discussion limited to ten minutes followed each of these papers. The papers will appear in later numbers of the Journal of the Canadian Peat Society.

AFTERNOON SESSION.

The Afternoon Session commenced at 2 p.m. Mr. P. L. Smyth of Montreal, the Vice-President of the Canadian Peat Society, in opening the meeting, said:

I am very glad that we are holding this joint meeting, not only because of the pleasure it gives us to welcome our friends from the United States among us, but also because I am sure the intercourse between members of the two Societies will tend towards the further development of the peat industry in all its branches. Personally I am interested in the production of peat for fuel. Others are interested in it from an agricultural point of view. I am interested in it also from that point of view, because at our little plant at Farnham our Superintendent has carried on some interesting experiments as far as agricultural products are concerned, and has met with more or less success.

There are two plants on a commercial basis in Canada—one managed by Mr. E. V. Moore of Peterborough, and the other by Mr. Carlsson and myself. I think that any of you who are interested in seeing fuel made will be well repaid in visiting either the one or the other. Mr. Moore has certain ideas of his own which I consider highly commendable. Mr. Carlsson, our own man, has put his ideas in our own plant, which is making peat fuel on a commercial basis. Both these plants it would well repay you to see. With these few words, and with the hope that our meeting will prove interesting and instructive to all, I bid you welcome.

Mr. Carl Kleinstueck of Kalamazoo, Michigan, asked if anything was being done in Canada in the production of peat litter. He said this had been imported from European countries into New York in considerable quantities. "I was in Holland in 1902, and the U.S. agent there had strict orders from the Secretary of State to give me all the help he could in investigating the peat litter industry. He welcomed me with open arms and said, "I am very glad that America is waking up—even if it is slowly—to the peat litter business. I have never been there, but I learn that right across from New York in New Jersey you have exactly the same peat as is being used for litter here in Holland, and if I appreciate the conditions you can raise that peat litter for $2 or $3 per ton." Hundreds of thousands of tons of this litter have been imported into New York and sold for as much as $15 a ton, and we wise Americans have been neglecting the very same thing which is right at our doors, and might be put on the market for $3 a ton. That is the way with us Americans, we must have things imported, and look stylish, while the good things at home go begging. It is very gratifying to me, however, to find that our imports of this peat litter have fallen from 185,000 tons a year to 90,000 tons. In another ten years I dare say we will have no use for imported peat litter."

Professor C. A. Davis of the U.S. Bureau of Mines, Washington, D.C., said he would like to know where Mr. Kleinstueck got his figures as to the importations of peat litter.

Mr. Kleinstueck:—From the Rotterdam agent of the Holland-American Steamboat Company, who is the American Consul there. When 185,000 tons were being imported, it was at the time when New York had horse cars. Besides that some large stock farmers used peat litter.

Mr. Julius Bordollo, Secretary-Treasurer of the American Peat Society:—There must be some mistake about large deposits of peat being across the river in New Jersey. There is no peat there fit for peat litter. We have been looking for several years to find such peat. There is some in Dutchess County, however.

Mr. Kleinstueck: Well, that is nearer than Holland.

Prof. Davis: Possibly it would cost less to take it across the ocean than it does across the river.

Mr. Kleinstueck: If Prof. Davis thinks there is no peat litter in this country, I challenge him to come to Michigan, and I will walk him tired on peat litter of sphagnum moss, ten to twelve feet deep.

Mr. Smyth: One meets with vegetable bogs all over the country. Mr. Carlsson who has examined bogs for us all over the country might perhaps let us know how often bogs have struck him as suitable for litter.

Mr. Carlsson: Such bogs exist more in the west than they do in the east, especially in Manitoba and Saskatchewan. In fact, in the Eastern Provinces, I have not seen one. None of them have any depth of any account that would make the peat of such a character as to be suitable for litter.

Mr. Bordollo: We are trying to start a peat litter industry in Dutchess County, but the difficulty is the question of cost. The freight to New York is $2 per ton. Delivery across the ferry to New York is 80 cents to $1.50 per car extra—and a car loads only 3 tons. Peat litter in Holland costs $5 a ton, and the steamship company sometimes when it has not got enough freight, will take it to New York for as low as from 50 cents to $1.50 a ton. Thus it is landed here for from $6.50 to $7.50 a ton. The thing here is how to get peat on the market cheap enough. The freight rate is enormous. If our peat deposits were 100 miles from New York, Holland would undersell us. All these questions have to be taken into consideration in order to make American peat litter a commercial proposition. The railroads should give special quotations on peat. At present peat is not listed, and they charge on the highest basis. When we complain of this, they say, "Ship some, and we will make a price." There are a great many difficulties to be encountered before we can get peat litter started. The thing is being tried out now, but it will be a few months before we can tell how cheap we can deliver peat. I think it can be done for $6 a ton, including freight.

Prof. Davis: There are very few bogs in the United States which I consider as a good proposition for peat litter, because you have to go over so much ground to get a sufficient quantity of the raw material to make it worth while. As to the bogs which Mr. Kleinstueck mentioned in Michigan, I spent three years

looking over the bogs of this country. As a general rule there is no sphagnum in them, and where there is sphagnum it is only about three or four feet thick. Below that we come to turf, and below that material which is better fuel than litter. While there are many bogs which have superficial deposits of sphagnum peat, there are few of any depth. There is another consideration which must be taken into account when discussing this question of peat litter. That is that the peat does not have to be sphagnum peat in order to make good litter. One of the most prominent European journals gives nine different kinds of peat which make good litter. In fact any peat not too much decomposed will make good litter. It is absorbent, a good disinfectant, and spongy enough to make good material for stock bedding.

Mr. Kleinstueck: I have experimented myself with live stock, and I find that any kind of peat makes excellent beds. The absorbent nature of peat makes it excellent for the prevention of sore feet. In fact those who use it consider that if they had to get peat litter at twice the price they pay for straw, it would still be preferable. It makes the stables sweet, and makes far better manure for land than straw, which does not absorb. It mixes readily with soil, and retains the ammonia far more readily than straw.

Prof. Davis said he had been talking with a man who kept a livery stable and who had been experimenting with peat litter. He had imported it from Holland and it cost him on the car $16 a ton, but he said he would use it in place of straw at $8 a ton if the peat litter cost $20 a ton.

Mr. G. Herbert Condict of Plainfield, N.J., said, down in Florida they thought it a crime to use peat for fuel, because it had so much more value as a fertilizer. The bogs there were under water for a great part of the time, in fact a great deal of the peat at one place was taken from the bottom of a lake 18 miles wide, 4 1-2 miles long and 5 to 15 feet deep.

Mr. G. Herbert Condict, of Plainfield, N.J., then read an instructive paper on "Utilization of Peat Tide Land."

DISCUSSION ON MR. CONDICT'S PAPER.

Prof. Davis referring to the value of peat as a fertilizer in Florida said: "With regard to the matter of soil, anybody who has been in Florida knows that there are thousands of square miles of what is apparently nothing but quartz sand. Where the water level is high good crops can be grown, but in other parts the vegetation that grows on these sandy soils is only a thin stubble in dry weather. Add vegetable matter in the shape of peat, and you get a mixture which enables the sand to hold to a great extent the water which comes in the form of rain, as well as that which is brought up from below by capillary action. Consequently, the people there, and especially the orange growers are anxious to get this relatively cheap organic material. This is a thing, however, which needs to be administered scientifically, and under conditions which can-

not be questioned, and I believe one of our functions as Peat Societies is to bring about this scientific study of the possibilities of the use of peat as a soil ameliorator. And as soon as we can get to it, I think the Societies should have in mind to find out just how much good the addition of peat does to quartz sand, and the conditions which would make this a commercial proposition.

Professor H. C. Thompson of the U.S. Bureau of Plant Industry, Washington, D.C.: I do not believe the use of peat for putting on sandy soils would be practicable except for crops of very high value. It is possible it would be on sandy orange groves, but I think it is entirely out of the question for the general farm crops grown in the South. The amount of this material necessary to have any effect on the water-bearing functions of the soil would cost too much on a soil where crops like cotton and corn are grown.

Prof. Davis: How do you know?

Prof. Thompson: I don't know, it is my belief. I am under the impression that the amount of peat necessary to put on these soils to have any appreciable effect on the water bearing capacity would be worth more than the cotton crop would amount to. The average farm does not get a return of more than $12 or $15 an acre, and I am sure it would take at least that much peat to do any good. Scattered over an acre of land, five tons of peat would be a mighty thin application.

Prof. Davis: You may be right. Still we don't know where peat can be used to the best advantage, we can only surmise.

Prof. Thompson: There is one other point I had not thought of. I have been in Florida quite a bit, and I remember that there are many truck farms where there are crops of from $500 to $1000 per acre, and on those it pays to put a high-priced fertilizer. I know some which have put on three tons of fertilizer per acre. If farms of this kind are deficient in humus it might pay to give them a dressing of peat.

Mr. Condict: It is among the farms which have high-priced crops that the demand exists at present.

Mr. Emslie: I am inclined to agree that for ordinary crops it would not pay to apply peat. I think the best use of peat, and that where we get the fullest value, is where we use it as a bedding material. It absorbs liquids. I have had considerable experience with peat litter and have found it much more valuable than straw.

Prof. Davis: The ordinary peat which comes from southern swamps, if not dried carefully is apt to dry in hard lumps as hard as soft coal. It needs to be aerated a good deal. It is not like normal peats. It is really an organic mud, and has to be handled quite differently from anything we get in the Northern peat deposits. The proof of all these things is not theory, but practice. You cannot sell farmers fertilizers that do not fertilize. If they try a fertilizer and get results, they will buy again, but you cannot persuade them to put their

money into stuff they have tried once without results, no matter how much their soil may, according to theory, need the stuff you recommend. There is an ancient prejudice, coming from our ancestors, that any dark soil is a good soil. Still you find some dark soils of which this is not true. Yet farmers will often buy a fertilizer that has a dark color, even if the color comes from charcoal. What we want to get is the value of these things in dollars and cents how much peat it is necessary to put on land in order to get twice the crops the land produces now.

ADDRESS BY MR. B. F. HAANEL ON EUROPEAN PEAT POWER PLANTS.

Mr. B. F. Haanel, Chief Engineer of the Division of Fuels and Fuel Testing, Mines Branch, Department of Mines, Ottawa, gave a short address on "Peat Power Plants in Europe." He mentioned in particular the Mond by-product recovery gas producer power plant now in operation near Orentana, Italy.

This power plant is designed for burning 70 tons of theoretically dry peat --but at the time of his visit was burning only 30 tons of 30 per cent. moisture peat. As a reason for the low capacity at which this plant was operating, he cited the extreme difficulty experienced in manufacturing sufficient peat fuel to supply the plant during an entire year. This difficulty is due in part to the nature of the bog owned by the company and partly to weather conditions. The bog, which comprises an area of about 400 acres, is on an average only 1½ meters deep (about 5 feet) and is understratified by a layer of clay about 1 foot in thickness at about a foot from the surface. In order, therefore, to manufacture peat fuel, the top layer must first be removed and made into peat fuel and the underlying clay stratum removed before the remainder of the peat can be utilized. This is an expensive operation, even when labor is cheap, and in other ways militates against the production of large quantities of peat fuel.

The bog is covered during the rainy season with water which must be artificially drained by pumping—for this purpose a centrifugal pump operated by an electric motor is installed at some convenient place.

Excavation is performed entirely by hand, the material thus won being fed into Dolberg peat machines. Only a portion, however, of the total quantity of peat manufactured is air-dried—the larger portion being excavated, stacked on the field and transported from time to time to the plant by gasoline locomotives and cars, where are situated two Dolberg pulping mills. Before putting this peat through the pulping mills it is first subjected to a few pounds pressure in an ordinary hydraulic hay press which reduces the moisture down to about 75 per cent. The peat containing this per cent. of moisture is now fed into the pulping mills and finally after leaving is broken into small fragments which are then placed on racks and rolled into drying chambers.

For drying the peat, air mixed with the waste heat from the steam boiler plant, the heat of the gas engine exhaust, and in addition the heat generated by a special air pre-heater, in which a quantity of gas, equivalent in heating value to 8 tons of peat burned daily, is forced by a 40 horse power electric fan through five drying chambers in which, as previously stated, the peat is placed.

The moisture is reduced by artificial drying from about 75 per cent. to 30 per cent.

The thermal efficiency of this drying apparatus is about 45 per cent. and where such waste heat can be put to other purposes it is a question whether such a method has any value whatever. It is quite safe to say that many plants do not exist where so much heat can be afforded to be used in this manner.

The second plant visited was that of the German Mond Gas Company, situated near Osnabruck, Germany. This plant has a capacity of 3000 H.P. Ammonia recovery is carried on at this plant throughout the year and although the Company has not up to the present time been able to declare a dividend, they hope in a short time to be able to reduce certain expenses sufficiently to show a profit. The principal item of expense at this plant is the peat, which costs in the neighborhood of $3.00 per ton. Difficulty in properly draining the bog, together with the excessively wet season which prevailed last year, prevented a large or sufficient output of peat fuel of the required moisture content and at a reasonable cost..

The manufacture of peat fuel at this plant is performed by Strenge mechanical excavator and spreaders, and also Dolberg machines, which employ hand labour for excavation.

In connection with the exploitation of such power plants as those mentioned, I may say, success depends on the quantity of peat fuel containing over one per cent. of nitrogen which can be manufactured and delivered to the power plant at a reasonably low figure (say about $1.50 per ton). As the nitrogen content increases, the cost of the fuel can increase, or vice versa, if the cost of the fuel remains constant, the profits derived from such a plant increase with the increase in the nitrogen content.

At Oldenberg, a plant of 5,000 H.P. capacity was visited, operated entirely by steam in which the only fuel used was peat. It has been said that the government of that State in which the plant is situated, manufactures and sells the peat fuel to the power company for about $1.20 per ton. This company distributes the power generated, in the form of electricity, to neighboring towns and villages and to farmers. Ploughing, etc., are performed largely through the agency of electricity in this portion of the province of Oldenberg.

It has been said many times that a peat fuel containing 60 to 70 per cent. moisture can be profitably used in producers. Such statements are not correct. When the moisture content exceeds 35 per cent. the production of ammonium

sulphate falls off, as does also the quantity and heating value of the power gas generated. The best results are obtained with a peat containing not more than 30 per cent. moisture. This moisture content, however, is very difficult to obtain at some places and where this is so artificial drying of a portion of the peat supplied to the producer might have to be resorted to.

In conclusion, I may say that the successful exploitation of a power plant designed to gasify peat fuel with or without the recovery of ammonium sulphate depends, first, on the cheapness with which a large quantity of fuel can be obtained, second, a steady market for the power developed, and thirdly, in the case of the by-product recovery plants, on the quantity of nitrogen contained in the peat. As a final consideration, I wish to impress upon all those contemplating the erection of such plants, that the capital cost, and operating expenses must be kept as low as is possible.

DISCUSSION.

Prof. Davis said that at one place in Europe he saw a battery of eight boilers which were being run with fuel containing 60 p.c. moisture. He would defy anybody to distinguish this fuel from half-dry peat. In Germany it was called brown coal. Something like 800 h.p. was developed with that fuel, and with no other fuel or preparation. This was in a village near Cologne, and the plant was able to furnish electricity at 3 cents per Kilowatt hour. If they got these results from brown coal he saw no reason why half dry peat could not be burned in the same furnaces.

Mr. Haanel: In a producer plant the moisture has to be evaporated, and the remaining amount of peat goes to gas. The efficiency of such a system is exceedingly low when using 60 p.c. moisture. In a producer you cannot expect to use fuel of over 30 p.c. moisture and get efficiency.

Prof. Davis: These boilers were very long in comparison with coal boilers. The fuel was introduced into the back of the furnace, and brought forward by a mechanical stoker, and dried to a very considerable extent before getting into the combustion area. Of course a good deal of heat is used up in that way, but they certainly get excellent results. It took, however, one-third of all the fuel of the mine to run it. It showed me that the German engineers have gone into this matter of handling fuels in a way the United States engineers have not done. Our boilers are all designed to use nothing but high grade bituminous coal. There are few boiler makers who construct boilers in consideration of the fuel that has to be used in them.

Mr. Kleinstueck: Is there any brown coal of that value in this country?

Prof. Davis: None of our brown coal has anything like the structure or amount of moisture which this Cologne brown coal has.

Mr. Kleinstueck: I fail to see what connection this has with burning American brown coal. Even if the grates are of peculiar construction, you simply have to burn good fuel in order to dry out the water.

Prof. Davis: My point is that they burn brown coal of 50 or 60 p.c. moisture and make a fair value, if they cannot get better. They utilize waste heat that would otherwise go up the chimney.

Mr. Kleinstueck: I am sure this brown coal feels far more moist than it is. I had experience with it in my youth.

Mr. Arthur J. Forward, B.A., of Ottawa, Canada, Secretary of the Canadian Peat Society, presented a paper on "The Economic Utilization of our Peat Resources."

Mr. E. V. Moore, speaking of peat fuel production said that as the result of the work carried on by the Department of Mines during two seasons, Dr. Haanel had expressed the opinion that mechanical means must be utilized to supersede hand labour as far as possible. There were now two plants in commercial operation in Canada in which this idea had been developed to a very considerable extent. While the process and product of both these plants was substantially the same, they differed somewhat in the methods of handling the material, and the type of machines employed. These differences could be more intelligently discussed on the ground, and he hoped that as many as possible of the members would visit both plants, and see them in operation. He would reserve his remarks further on the subject for which he had been set down in the program until the visit to the Alfred bog.

EVENING MEETING

In the absence of Mr. John Wiedmer of St. Louis, Mo., his paper on "Dried Peat as Stock Food" was read by Mr. Julius Bordollo, Secretary of the American Peat Society, who then presented his annual report of the Society.

Professor Charles A. Davis of the United States Bureau of Mines gave a most interesting Review of the Peat Industry during the past season.

In the discussion which followed Mr. Smyth said he thought one of the principal things which should be considered by Peat Societies was not so much the immediate production of peat fuel as the conservation of our peat. He noticed in the report that mention was made of the peat producer plant put on the market by a company in the United States. He did not consider this should be given endorsation by a Society of the standing of the American or Canadian Peat Society. The machine in question had one feature which he did not consider very valuable. It excavated along the face of a trench continuously back and forth till it left a great lake behind. His experience in the production of peat was that if the season was wet with a great lake like that, they would have so much water that they woul dnot know what to do with it. In other words they would have to handle much more peat than was really necessary. He considered that to make peat properly they must excavate in a trench. The best machine was one which would dig a trench and leave dams. If a dry season

came they could break down the dams, while in a wet season, the dams would control the water. He did not condemn the machine, but for the reasons he put forward, he thought the Societies should be careful not to endorse any make of machine whatever.

Prof. Davis: I am very glad to have this point taken up. One of the principal objects of the "Journal" is to give place to discussion of this kind, and one of the most valuable things would be to have criticism of any paper in the "Journal." It must be understood that anything which appears in the "Journal" as a part of the proceedings of the Society is open to criticism by anybody. If they do not criticise, we assume they approve. I feel that while we should not endorse these things, it would be a very difficult matter to exclude a communication from any member of the Society, and the only real way in which we could show that the Society does not endorse it is for members to take it up and criticise it. Then there would be the same freedom for replies. We have a lot of things published in our "Journal" simply as a matter of record, and in the hope of promoting discussion. I think the "Journal" should serve the members, and being the responsible editor of the "Journal" of the American Peat Society, I am glad the point has been brought up.

Mr. Haanel: I should like to hear from men engaged in the production of peat as to the proper construction of peat machines.

Prof. Davis: That is a very important question, but I am afraid if we try to discuss it we shall be here all night.

Mr. Haanel: The mechanical excavation of peat is very important, and I should like some little discussion.

Prof. Davis: My experience is that there are peat bogs and peat bogs. On one bog you can use one type of machine and on the other another.

Mr. Haanel said he would like to know what was done when stumps or other obstacles were encountered in excavating peat. Were the machines capable of dealing with these, or were they put out of action for the time being? Also he would like to hear what were the objections to excavating peat with a steam shovel.

Mr. Smyth and Moore said these points could be better explained on the ground, and when Mr. Haanel visited the plants tomorrow the whole matter of excavation could be thoroughly explained.

Mr. Haanel said this matter was a very important one, for on the employment of mechanical methods the whole success of the industry would rest.

Prof. H. C. Thompson of the U.S. Bureau of Plant Industry, Washington, then gave an illustrated lecture on the results of the experimental work with muck soils in the greenhouses of the U.S. Department of Agriculture at Arlington, Va., this season. He said they considered they had been getting good results with certain soils and fertilizers in the greenhouses, but had had much better success with the use of peat, or as he preferred to call it, muck soil. He

showed many pictures of lettuce and cauliflowers grown in pure muck soil, or in various admixtures of muck soil and the ordinary greenhouse soil. These showed that muck soil was far better than anything else for greenhouse work. The best results were obtained with muck soil without the addition of fertilizer. The results of many experiments, with crops side by side on the various soils, and with check crops were given in tabulated as well as pictorial form.

AN INVESTIGATION AS TO PRESERVATION OF APPLES IN PEAT MULL.

By E. Nyström. Reported by Dr. Hjalmar von Feilitzen, Director of the Swedish Peat Society, Jönköping, Sweden.

(Translated from Mitteilungen des Vereins Zur Förderung der Moorkultur im Deutschen Reiche).

Experiments have been made for many years in the application of peat mull to preservation of fruit, and particularly in the fruit and vine culture school at Geisenheim investigations have been carried on.

As to the results, however, very little definite information was obtainable. We therefore decided in the autumn of 1911 to undertake an investigation with different sorts of apples at the experimental station of the Swedish Peat Society in Jönköping.

The experiments were very carefully conducted by the superintendent engineer, Mr. E. Nystrom. In the July number of our Journal he gave an interesting report of the results, illustrated by very good cuts. As this may be of value of those interested in peat in Germany, I will here set down the most important of these results.

The author rightly prefaces his report with the statement that thoroughly satisfactory preservation of fruits during any lengthy period can be secured only in cool rooms specially thereto adapted, where the temperature of the air and its moisture content can be properly regulated. Experience in storage of fruits under such conditions has shewn that the temperature must be held uniformly at a low point (from 0 to $+2°$ C.), and the relative humidity at about 80 per cent. In ordinary fruit storing rooms the temperature is often variable and especially in the early autumn altogether too high ($+8°$ to $+10°$ C or even higher). The result is that part of the fruit soon begins to rot, and even when it continues sound loses its fresh appearance and becomes wrinkled and unsightly. In order to sustain in some measure the keeping qualities of fruits, and to hinder too great evaporation of water and consequent shrinkage, it is sometimes recommended to keep them in chaff, bran, peat mull, cork dust, or the like.

At our experimental station an experiment was made on a small scale with three kinds of apples ripening at different times, and of different keeping qualities. These were:—

Gravensteins, ripening in Sweden in November, and keeping by ordinary methods until February.

Winter Goldpearmains, ripening in December, and keeping until March, and

Ribstons, ripening in January and keeping until May.

Of each sort three rows of about 50 apples of equal size were used.

Row A.—The apples were laid in a single layer on a shelf in the cellar storage room.

Row B.—The apples were carefully laid in peat mull so that each was separated from the others by a layer of the mull.

Row C.—The apples were wrapped in silk paper and laid in peat mull.

The average temperature in the storage room was in

December	+ 8.5° C.
January	+ 3.9° C.
February	+ 4.7° C.
March	+ 7.2° C.
April	+ 7.2° C.
May	+ 9.0° C.

The highest temperature was on December 5th, + 10° C., the lowest on February 2nd,—0.5° C. The humidity of the air varied between 60 and 80 per cent. The storage room was far from ideal for the preservation of fruit. The temperature was too much dependent on the outside temperature and generally too high, and the air was often too dry.

The apples lying on the shelf soon began to wrinkle, and were more or less attacked by rot. The experiment with the Gravensteins was continued until February 21st, and with the other two sorts until May 10th.

The following were the results:—

(1)—GRAVENSTEINS.

Time of keeping from December 5th, 1911, until February 21st, 1912.

In each row under observation there were placed 43 perfectly sound apples of equal size.

Method of Preservation.	Weight at the beginning of the experiment Gr.	Weight at the end of the experiment Gr.	Loss in weight Gr.
(1)—On the shelf	3808	3035	773
(2)—In the peat mull	4018	3723	295
(3)—In silk paper and peat mull	3810	3534	276

Fig. 1
Gravensteins kept in single layer on shelf. Appearance after 2½ months.

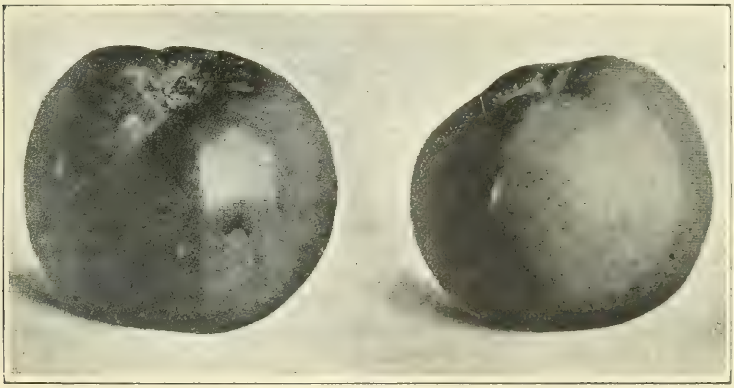

Fig. 2
Gravensteins kept in peat mull. Appearance after 2½ months.

Fig. 3
Winter Goldpearmains kept in single layer on shelf. After 5 months.

Fig. 4
Winter Goldpearmains kept in peat mull. After 5 months.

Fig. 5
Ribstons kept in single layer on shelf. After 5 months.

Fig. 6
Ribstons kept in peat mull. After 5 months.

At the close:

Sound No.	Attacked by Rot No.	Loss of Weight Per Cent.	Spoiled by Rot Per Cent.	Total Loss during storage by loss of Weight and through rot. Per Cent.
(1)— 6	37	20.3	86.0	86.5
(2)—23	20	7.3	46.5	49.1
(3)—23	20	7.2	46.5	49.1

(2)—WINTER GOLDPEARMAIN.

Time of keeping from December 5th, 1911, until May 10th, 1912.
In each row 45 sound apples of equal size.

Method of Preservation.	Weight at the beginning of the experiment Gr.	Weight at the end of the experiment Gr.	Loss in weight Gr.
(1)—On the shelf	2303	1584	719
(2)—In the peat mull	2518	2203	315
(3)—In silk paper and peat mull	2388	1985	403

At the close.

Sound No.	Attacked Rot No.	Loss of Weight Per Cent.	Spoiled by Rot Per Cent.	Total Loss during storage by loss of Weight and through rot. Per Cent.
(1)—26	19	31.2	42.2	59.8
(2)—35	10	12.6	22.2	30.5
(3)—33	12	16.9	26.2	39.9

(3)—RIBSTONS.

Time of keeping from December 5th, 1911, to May 10th, 1912.
In each row 45 sound apples of equal size.

Method of Preservation.	Weight at the beginning of the experiment Gr.	Weight at the end of the experiment Gr.	Loss in weight Gr.
(1)—On the shelf	2417	1940	477
(2)—In the peat mull	2758	2482	276
(3)—In silk paper and peat mull	2789	2495	294

At the close.

Sound No.	Attacked by Rot No.	Loss of Weight Per Cent.	Spoiled by Rot Per Cent.	Total Loss during storage by loss of Weight and through rot. Per Cent.
(1)—26	19	19.7	42.2	54.7
(2)—39	6	10.0	13.3	24.0
(3)—32	13	10.5	28.9	37.9

As shown in the preceding tables the preservation in peat mull reduced the loss through rot by one-half and the loss of weight by one-half or at least one-third. That the percentage of rot in the apples kept in the peat mull was apparently considerable, was due probably to the fact that the peat mull used was not dry enough. It contained at the time the fruit was stored 37.8% water (good mull should not contain more than 25, or at the highest 30% of moisture. Apparently it is also due to humidity of the mull that the apples wrapped in silk paper showed a higher percentage of loss from rot than those without paper. Especially noteworthy was the difference in the appearance of the apples. Those kept on the shelf were very much wrinkled, while those in the peat mull retained their fresh appearance and their smooth shining surface. The preservation of fruit in peat mull can therefore be recommended where it is handled in small quantities and good fruit storage rooms are lacking. But special care must be taken that the peat mull is well dried and that the storage room is keep cool but free from frost.

PEAT FUEL PRODUCTION IN QUEBEC, 1912.

The Peat Industries, Ltd., has now passed the experimental stage and is producing peat fuel on a commercial scale. This Company has secured an area of 1,200 acres of excellent peat bog, at Ste. Brigide, five miles from the town of Farnham. The work done on this bog by the Peat Industries, Ltd., comprises a main drainage ditch, 1,500 feet long, 10 feet deep, 7 feet at the top, 2 feet at the bottom; over 6,000 feet of smaller ditch 3 feet deep and 2 feet wide.

The equipment in the field consists of a peat machine of the Anrep type, but modified to meet the local conditions. It is worked by a 45 H.P. gasoline egnine which operates the excavator, the macerator, the endless cable to which are clamped the cars, and the spreading machine.

The plant has a capacity of 40 tons of dried peat in ten hours.

The peat is entirely air-dried, as it is now recognized that this is the only practical and economical way of producing peat-fuel. The dried peat is conveyed to the Central Vermont Ry., which crosses the bog, by small cars running on 24 in. gauge tracks. The plant requires seven men for its entire operation.

The peat was sold in 1912 at the rate of $4 a ton f.o.b. Ste. Brigide.

It is to be regretted that the whole of the summer of 1912 should have been extremely unfavourable to the production of air-dried peat. The continual rains greatly interfered with the operations, but it is hoped that the 1913 campaign will be a successful one.—(Extract from Report on Mining Operations in the Province of Quebec during the year 1912, Mines Branch Department of Colonization, Mines and Fisheries, Quebec).

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EDITORIAL.

Several interesting papers read at the Joint Meeting of the American and Canadian Societies in Montreal on August 18th, have unavoidably been held over until our next issue.

Owing to the dry season extensive bush fires occured through Ontario and Quebec during August, and large areas of the bogs at Alfred and at the Mer Bleu near Ottawa were burned over. On the day of the visit of the Peat Societies to Alfred, August 19th, the operation of the plant was cut short by the employees being called off to fight fire which threatened the buildings on the bog.

A COMBINATION PEAT FUEL.

We are in receipt of a letter describing a fuel composed of peat combined with chemicals not designated, which has been made on a very small scale experimentally in one of the Eastern States. The claims made for the fuel are that the chemicals cause it to give intense heat, that it burns slowly, and produces very little smoke, etc. It is stated that fuel manufactured according to the formula can be placed upon the market at a good profit below one-half the price of coal. An ordinary brick machine is said to be all the machinery needed, and it is claimed that by this process fuel can be made through the entire year. The writer says, "To instal a machine and build a shed ready to manufacture this fuel ought not to cost in excess of $500."

The method of manufacture, which has been carried on only upon a very small experimental scale, may be described as follows:-

The peat and chemicals are mixed in a mixer, the mixture pressed and cut into block of any required size, and these blocks dumped in loose piles to dry. It is claimed that, "It takes care of itself in the piles and dries quickly and becomes hard."

Probably every claim made for this fuel has been made hundreds of times before. As pointed out elsewhere in this issue, prior to 1902 there were some 400 patents issued in the United States on combined or artificial fuels, but not one of these had proved commercial. This affords strong presumptive evidence that addition of crude oil or chemicals to peat is not likely to prove commercial unless perhaps under exceptionally favorable circumstances. The statements made as to possibility of working through the entire year, and low cost of plant required are extremely misleading, and based apparently on misconception of the problems involved.

Raw peat contains roughly 90% of water. This water content must be reduced to approximately 25% to make an efficient fuel. In other words, 10 lbs. of raw peat will produce 1 1-3 lbs. of peat fuel, 8 2-3 lbs. of water having to be got rid of. Experiments on a small scale are apt to be very misleading.

It is a very simple matter to produce 1 1-3 lbs. of fuel from 10 lbs. of raw peat, or even to produce 133 lbs. of fuel from 1000 lbs. of raw peat, without any elaborate equipment. Operation on a commercial scale is a very different thing altogether. To produce 50 tons of fuel in a day of 10 hours, it is necessary to raise from the bog, press, cut, handle and rehandle say 375 tons of raw peat in that time or 37½ tons per hour. This involves the use of mechanical excavators, extensive drying areas, and machinery for distributing and spreading.

Experience shows that the peat blocks must be turned, and the only practical method of drying yet discovered is by exposure to the influence of sun and wind during the summer months.

We cannot emphasize too strongly that there is no difficulty whatever in the way of production of an excellent fuel from peat by the simple process of

maceration and air drying. Millions of tons are manufactured yearly by this method in Europe. The whole problem in this country is to produce sufficiently large quantities at low enough cost to render the operation commercial. The real obstacles in the way of success are the short season, the high cost of labor, and the cost of marketing the product. During the past three years great advancement has been made in Canada in the way of improved mechanical appliances for excavating and spreading the peat, and it is along this line that the true solution of the problem lies.

PEAT POWDER—A NEW FUEL.

The fuel question is in spite of everything, one of the principal economical questions of the world, and even if all obtainable water power is ultimately utilized, the demand for fuel will remain unchanged or increased.

Attention has for a long period been fastened on the turf-mosses, of which inexhaustible supplies are found, but the turf cannot without improvement be used for burning purposes, and all experiments to produce from turf a satisfactory fuel has met with great difficulties. It has either become too poor or too expensive, or both combined.

During later years a new method has been tried, viz., the production of powdered peat, and with this there will be a radical change in the problem. The excellence of the new method lies in the fact that it can be entirely worked by machinery. With very little help great quantities of turf can be taken up and dried at a very low price, and since the raw material can be obtained so cheaply, it is possible to give it a satisfactory improvement.

As the principal question with the peat industry is that of leaving as little water as possible in the peat and as this of course can be best done when it is in a powdered state, which at the same time is the ideal form of fuel, the new method very ingeniously combines these two forms.

Experiments with both stationary and movable boilers have proved that with peat powder a larger effect is obtained than when firing with coal. Another fact is, that when firing with peat powder there is no smoke or sparks. This is a great advantage for locomotives frequently cause fire to break out along the line.

As the foremost experts have proved that the peat powder can be made at a price of Kr. 8.50 ($2.27) per ton and the several trials have proved that 1 3-10 tons of peat powder equals 1 ton of first class coal, the price of the latter must necessarily be lowered to Kr. 10.75 ($2.87) per ton in order to compete with the peat powder.

In addition as regards boilers, the peat powder can be used to advantage in the clay, glass, cement and iron industries. With direct firing, the highest temperature, which any of these industries require, has been obtained.

The new method has been invented and worked out by Mr. H. Ekelund, of Jönköping, who has spent more than twenty years on this study. The method is in use by the "Aktiebolaget Torfs Factory" at Back in Smaaland, Sweden, which produces about 15,000 tons per year, and which has obtained excellent results. Even the most sceptical have after a thorough study of the results had to acknowledge that the matter is no longer an experiment but a method worked out in every detail, and already in practical use. Several of the railways in Sweden have entirely gone over to using powdered peat for their engines. Foreign countries have also shown much interest in this new method. In Finland there is a large plant for manufacturing powdered peat fuel being built to be used by the Finnish state railways. For several other countries negotiations are being carried on for the selling of the patent. (Extract from report by C. E. Sontum, Canadian Commercial Agent at Christiana, Norway—Weekly Report of the Department of Trade and Commerce of Canada, Sept. 8th, 1913).

NOTE.—Experiments in the use of powdered peat as a fuel were successfully carried out in Canada several years ago by C. A. Sahlstrom of Jönköping, Sweden.

A small plant was erected on the Brockville bog in 1905 to demonstrate the drying and carbonizing method and apparatus devised by Prof. Sahlstrom. The peat, collected from the bog by harrowing and raking in heaps, was dried in the form of powder, and afterwards ground to a fine dust in a small mill. The dryer and carbonizer were so designed that the necessary heat for their operation could be supplied by blowing this finely powdered peat into the fire box underneath the carbonizer. A number of trial runs were made and the peat powder was shewn to be a most efficient fuel. Operations were discontinued owing to lack of capital.

FUEL BRIQUETTING IN THE UNITED STATES.

The total quantity of briquetted fuel made in the United States in 1912, according to a report by Edward W. Parker, was 220,064 short tons, valued at $952,261. Nineteen plants contributed to the production, of which nine in the Eastern States produced 107,181 tons valued at $370,841, seven in the Central States produced 89,714 tons valued at $400,624, and three on the Pacific Coast produced 23,169 tons valued at $180,796. Seven plants used anthracite culm, nine used bituminous slack, and one used peat.

The report states that vast and almost untouched areas of lignite in North Dakota and Texas contain enormous supplies of fuel that European experience has taught is well adapted to briquetting. It also says with regard to peat:

"The large areas of peat beds in the United States are also available as a source of raw material. They are generally remote from the coal fields, and the briquetted fuel from peat, when properly prepared, makes an excellent substitute for coal. The peat now produced in the United States is used for stable litter, fertilizer, etc. None is used raw for fuel."

NOTE.—From the fact that the one company interested in the briquetting of peat is reported to have manufactured only 250 short tons during the season, it may be readily inferred that operations have not reached a commercial stage. Several companies were formed in Canada a few years ago to manufacture peat briquettes but none of them were successful.—Ed.

Production of Briquettes in the United States in 1907, 1908, 1909, 1911 and 1912, in short tons:—

Year	Quantity	Value
1907	66,524	$258,426
1908	90,358	323,057
1909	139,661	452,697
1911	218,443	808,721
1912	220,064	952,261

PEAT PRODUCTION SMALL.

While the United States is the richest country in the world in the deposits of peat, little active work is done in mining or digging it. So far as is known very few of the peat-fuel plants established have gone beyond the experimental stage and many of them have never been equipped with essential machinery.

Reports from all known peat-fuel plants in the United States, according to an advance chapter from "Mineral Resources, 1912," on the production of peat in 1912, by Chas. A. Davis, show that with one exception they were idle during the summer of 1912.

The output of peat fuel was reported as about 1300 tons, valued at $4550. All this peat was sold. A copy of the report on peat may be obtained free on application to Director, U.S. Geological Survey, Washington, D.C.—Power, September 2, 1913.

REPORT ON COAL AND POWER INVESTIGATION.

By R. O. Wynne-Roberts, M. Inst. C.E.

(Printed by Order of the Legislative Assembly of Saskatchewan, 1913.

This exhaustive report recently issued by the government of Saskatchewan contains much valuable data as to the quantity, location and quality of lignite deposits in that Province, methods of transforming lignite into power, and transmission of same, local markets for power, etc.

The general problem sought to be solved is thus stated:

> "The Province of Saskatchewan has developed in a remarkable manner during the last few years and there is every prospect for a continuation of its development in the future. There are, however, conditions which will tend to retard its progress and development and those are mainly the cost of fuel and therefore power, and cost of living and therefore labour. The extraordinary expansion of agricultural industry and the great extension of railways now create an increasing demand for labour but in time this will be adjusted. The natural sequence to railway expansion and Provincial progress will be the establishment of mills, factories, electro-chemical works and other forms of enterprise which will need cheap fuel and power. Where industries are located these elements must be found or such enterprises will decay, to the great disadvantage of the community. A growing population ncessarily calls for various local industries to provide for its daily wants, and at the cheapest rate, and this tends to make the variety of local industrial enterprises interdependent and mutually helpful.
>
> The cost of imported fuel renders it commercially difficult to run industries in this Province unless the price of the products are high and this directly or indirectly reacts on every other form of provincial enterprise. Virginia coal which costs less than \$1 per ton at the mine, costs about \$8 per ton in Regina . Pennsylvania anthracite costs about \$2 at the mine, whereas in Regina it costs \$12 per ton. More or less the same costs are prevalent through the province. Alberta coal, of course, costs less, but more must be consumed to obtain similar results. The cost of railroad transportation constitutes the bulk of the increase in the price of coal in this Province.
>
> As is well known, Saskatchewan has no local supply of bituminous coal and up to the present by far the greater part of fuel consumed is imported either from the States or from the vicinity of the Rocky Mountains, both of which entail long haulage and heavy freightage.
>
> It is, however, an interesting coincidence and a consideration of great economic importance that in those parts of North America and more particularly the central Prairie Provinces, which are so remote from the fields of superior coal, lignite—and in some parts peat also—is found in large quantities; and it needs only to ascertain the best method of utilising them to obtain the best results, when the absence of superior coal will be compensated by the presence of fuel which will cost less for equal power."

Some interesting facts are stated bearing on the increasing field for employment of low grade fuels and the prospective use of lignite and peat for power production. It is pointed out that in Great Britain attention is being paid to coal wastes which were formerly dumped over the tip as useless. The most inferior of slack and washery-refuse are now being consumed in considerable quantities for the production of cheap power. The North-East Coast Power System has seventeen generating stations of which six are coal-fired, and the remainder waste heat stations, where steam for generating electricity is obtained either from exhaust steam or by steam raised by blast furnace gas, or

from the waste heat and gas from coke-ovens, the total horse power connected amounting to nearly 200,000.

In Germany science and art have been so developed in the utilization of low grade fuels such as lignite, peat, etc., that immense power plants are now in operation and others projected.

The value and consideration of cheap fuel and power in the United States are being more fully appreciated each year. The result is the establishment of power plants where formerly it was not thought possible, and this is opening out new industrial centres to the advantage of all concerned.

"As an indication of the magnitude of the use made of cheap gas in the States, the following figures may serve to emphasize the foregoing statements:

Producer gas for gas engines, heating open-hearth furnaces, and gas retort benches,	
for power only	35,000,000,000 cubic feet
for heating only	100,000,000,000 cubic feet
Blast furnace gas	2,900,000,000,000 cubic feet
Natural gas	480,707,000,000 cubic feet

Lignite or brown-coal, whether considered physically or chemically, may be justly regarded as a substance intermediate between peat on the one hand and bituminous coal on the other. The lignite fields of the Western Provinces are estimated by D. B. Dowling of the Geological Survey to contain over 100,000,000,000 tons. Lignite, when exposed to the atmosphere, crumbles or disintegrates, tending to waste in use, and its mining is at present more or less a winter industry. It is hoped by means of briquetting to enable the industry to be carried on the year round. The production in Saskatchewan in 1911 was 206,779 tons, of which 104,000 tons were consumed in the province, representing 17% of the total fuel consumption.

It is stated that Berlin (Germany) alone consumes an average of over 100,000 tons per annum, constituting from one-third to three-quarters of the total coal consumed.

The Saskatchewan lignite has proved excellent for use in the down draft producer.

"Peat is capable of producing excellent illuminating gas by distilling it in cast iron retorts, heated from the outside." "The distillation of peat for illuminating gas manufacture must be carried on at a red heat, or higher, in order to decompose the heavier hydro-carbons into permanent gases that will furnish substances to brighten the flame when the gas is burned." "If distillation is carried on at temperatures that are too low the gas contains more carbon dioxide and gives a colourless flame when burned. The percentage of carbon dioxide may reach 25 to 30 per cent and even more if the peat used is not thoroughly dried when it is put into the retort. The evaporation of the water present lowers the temperature of the gases formed so much that the carbon dioxide developed is not decomposed." The quantity of lime necessary for the removal of carbon dioxide is great, and this has operated against the use of peat as a source of illuminating gas. Peat is stated to be capable of yielding from 8,900 to 10,400 cubic feet of gas per ton of 2,000 pounds. "That it might be used in properly designed and constructed plants in regions remote from supplies of suitable coal and where peat is common is clearly indicated."

"Lignite has already been described as a substance intermediate between peat and bituminous coal, and what is claimed producible from peat may be reasonably claimed for lignite."

"A Mond gas installation worked on Italian peat with a moisture content of 45 per cent., produced per ton of dry peat 60,000 cubic feet of gas, having a calorific value of 166 B.T.U. per cubic feet, and also 115 pounds of sulphate of ammonia, which is an excellent fertiliser.

A 7 foot diameter Kerpley gas producer has been installed at Pionbino, Italy, to gasify lignite having a heat value of 9,350 B.T.U. and this produced gas possessing a heat value of 161 B.T.U. per cubic foot.

At least 250 gas producers of one make have been installed to gasify lignites in Europe."

Several of the conclusions with regard to lignite arrived at by Mr. Wynne-Roberts and recommendations made to the government of Saskatchewan are equally applicable to the extensive peat deposits in several of our provinces, e.g.

CONCLUSIONS.

"The large quantities of workable lignite deposits in the Province of Saskatchewan can be utilised at the coal centres for the production of power and its distribution in parts of the province.

The generation of electrical power at such coal centres is both a practicable and commercial possibility, and its distribution at a low rate per kilowatt is feasible, if the larger municipal authorities will co-operate by taking currents in bulk. It was the co-operation of the municipal authorities at the initial stage of the development that made the North East Coast Power System in England the huge success it is.

The manufacture of lignite gas at a gas works located on the coal fields is also a practicable and commercial possibility. The quality of this gas will not be equal to coal gas, but it can be supplied at a much lower price per 1,000 cubic feet if the larger municipal authorities will co-operate in taking the same in bulk. This gas will be useful for power and heating purposes and if it is required to be of a higher illuminating value, it can be easily enriched by the authorities at small expense.

It is not possible by means of imported fuel consumed at individual power stations to produce as cheap electricity or gas supply as can be done in bulk at the coal centres and delivered same to the points of consumption."

RECOMMENDATIONS.

That further and more extended investigations be made with the view of promoting the use of lignite as fuel and thereby the development of the mining industry in Saskatchewan.

That experiments be made to find out the most satisfactory method of consuming lignite for domestic purposes.

That complete analysis be made of lignites found in this province.

That the lignite fields be explored to ascertain their area, extent, positions and values.

That the railway companies be asked to give preferential rates for local lignite as is done in Texas.

That government institutions use lignite where found economical."

USE OF PEAT IN EARTH CLOSETS.

Among other uses to which peat mull or peat dust may be advantageously put is its employment in dry earth closets or outside privies. It is a well known fact that very unsanitary conditions are found at many summer resorts where a number of people congregate for several months during the hot season, and where there is an absence of sewers or other efficient means of disposing of excreta. Many typhoid cases which develop in our cities during the early fall

months are directly traceable to the unsanitary surroundings in which some part of the summer was spent.

There can be no doubt that much of the danger, to say nothing of the discomfort, of such conditions could be obviated by the use of peat dust in closets. Several years ago a considerable quantity of peat dust was brought from Brockville and distributed at Britannia Bay, a summer resort near Ottawa, for this purpose. The results were very favorable, and a demand was established, but owing to inability to secure a regular supply its use was discontinued.

Peat dust is a powerful deodorant, and its use in a closet or privy entirely does away with disagreeable odors. Moreover the contents of the closet where it is used can be removed without offence and are in a condition to be utilized on the soil.

A special earth closet or commode for the use of dry peat dust or mull was devised several years ago and patented by the late Thomas Macfarlane, Dominion Analyst. Its essential feature is a moveable shelf on which the peat absorbent is placed and the excreta received. The peat can be used several times before becoming too moist for continued use.

Several other closets for the same purpose have been invented from time to time, and the construction of a suitable apparatus is not beyond the skill of any ordinary carpenter. Now that we have several parties operating in the production of peat fuel and it is to be hoped that this mode of utilizating peat may receive the attention it deserves. It is well worthy of consideration by the health authorities, especially in the districts surrounding our cities which though thickly populated do not enjoy city conveniences.

EXPERIMENTS BY THE LATE THOMAS MACFARLANE, DOMINION ANALYST, IN THE USE OF PEAT IN CLOSETS.

A series of experiments were conducted several years ago by the late Mr. Macfarlane as to utilization of human refuse, an account of which is embodied in a paper entitled "On the Loss of Substances useful as Plant Food sustained in Moss Manure" read before the Royal Society of Canada in 1904 (Section 3, 1904, No. 11).

A closet (such as already above described) was charged in the spring of 1903 with 20 lbs. moss litter, and the product was removed, weighed and sampled in October. **The removal and subsequent handling of this product was easily accomplished and without the slightest annoyance to anyone. Even in the drying of the sample there were no disagreeable emanations, thus affording another proof of the efficiency of the moss litter as a deodorant.** The product for the six months weighed 70 lbs., and part of it lost in drying, an amount

equivalent to 62.6% water, or 43.8 lbs. on the 70 lbs. The dried sample representing 26.2 lbs. assayed as follows:

Nitrogen	4.88 per cent.
Phosphoric Acid	4.79 per cent.
Potash	3.12 per cent.

A subsequent experiment made with a peat commode placed in a small apartment upstairs in a dwelling house, gave the following results:

"The use of this commode began on the 1st November, 1903, and on the 31st January, 1904, the contents were removed and sampled, both use and removal taking place without the slightest annoyance to the house inmates. It was charged with 15 lbs. moss litter at the beginning of the experiment, and the product weighed 60 lbs. It smelt slightly of ammonia, and was alkaline to litmus paper, and therefore previous to drying the sample of 435 grammes, 5 cubic centimetres of oil of vitriol mixed with 45 c.c. of water were added to prevent loss of ammonia. The loss in drying amounted to 67.5%, so that had the 60 lbs. of product been dried like the sample it would only have weighed 19.5 lbs. The analysis of the dried sample gave:

Total Nitrogen	3.33 per cent.
Phosphoric Acid	3.52 per cent.
Potash	1.05 per cent.

These results showed a great deficiency in nitrogen content, and as 84% of the nitrogen in human excreta is contained in the urine, laboratory experiments, as described in the paper, were undertaken to ascertain the cause of the loss. The results obtained showed that almost the whole of the nitrogen contained in urine is lost when the latter is absorbed by moss litter, and its water allowed to evaporate spontaneously with unlimited access of air.

"A series of experiments was next undertaken for the purpose of retaining the nitrogen as ammonia by mixing with the moss litter substances containing salts and acids capable of fixing the volatile alkali. The urine was absorbed by the moss litter, and allowed to dry gradually as above described. It is unnecessary to give all the particulars regarding these trials, but it may be stated that in all cases sufficient of the added substances was used to effect the retention of the ammonia if all the nitrogen of the urine had been developed in that form. The results were as follows:

	Proportion of Substances to Urine as 1 to	Loss of Nitrogen
A mixture of equal parts of bone superphosphate and double manure potash salt	6.11	16.0 per cent.
	8.91	24.1 per cent.
	3.36	31.1 per cent.
Sulphate of magnesia	6.75	38.5 per cent.
Land Plaster, ground	6.32	28.1 per cent.
Land Plaster, ground	10.76	60.7 per cent.

These results lend confirmation to the idea already expressed that urea in decomposing under the above described circumstances is not all resolved into carbonic acid and ammonia, but that a varying quantity of nitrogen escapes in the free state. The presence of acid and neutral substances capable of fixing ammonia does not prevent this, and the development of nitrogen seems to be owing to the excess of air which was used in these experiments. This unlimited access was of course necessary for the elimination of moisture, an advantage, however, which cannot possibly compensate for the loss of nitrogen. There cannot be any doubt that in the ordinary treatment of barnyard manure the same influences are at work, and that in spite of the presence of substances capable of retaining ammonia, losses of nitrogen take place when the manure heaps are allowed too great a degree of porosity."

While the results recorded by Mr. Macfarlane are largely of a negative character, there is no doubt room for further research and experiment to ascertain the physical conditions necessary to the most efficient retention of nitrogen in using moss litter.

PATENTS RELATING TO PEAT ISSUED BY THE CANADIAN PATENT OFFICE.

No. 147434—April 22nd, 1913.

The National Fibre Products Co., Assignee of Bernard Granville, New York. Method of Recovering Peat From Peat Bogs.

The invention has for its object to secure economy of excavation and separation of the fibre contained in peat with a minimum of breakage of the fibre with a view to its production for manufacture of paper and other articles. By directing a powerful stream of water on the peat in the bog it is disintegrated, the fibres washed out and held in suspension in the water used for cutting. After the water is drained off the fibre is subjected in turn to weak alkaline and acid solutions, as described, causing it to shrink and solidify and adding to its strength. Water is forced at a pressure of from 40 to 200 lbs. through a pipe to a standard hydraulic giant located preferably at the deepest part of the bog.

Claim:—The herein described method of excavating and separating peat fibre from the other constituents of the bog, the same consisting in applying to the peat as it lies in the bog a powerful stream of water, thereby cutting the peat and forming a body of water carrying the fibre and other constituents from said body and separating the fibre therefrom, substantially as described.

No. 148778 June 17, 1913.

Ernest August Persson, Emmaljunga, Sweden.

Peat Conveyor.

The mill is arranged on the frame of a portable engine moveable on rails along the bog. Two endless wire ropes driven by means of a bevel gear system are carried over pulleys fastened to the framework of the engine and run to a station truck consisting of a frame resting upon wheels and carrying two pulleys in swivel bearings. The station truck is adapted to be moved on rails in a direction transverse to that of the wires, and may be at any convenient distance, as much as 200 metres to advantage. The wires are so driven that their upper surface moves from the engine, and are supported and kept in position by specially designed portable horses. The peat as it comes from the mill is fed on to boards which as they are loaded are pushed in succession on a vertically moveable roller conveyor whereby they are deposited on the moving upper portions of the wires, and carried along the wires to the portion of the drying ground where they are to be unloaded. The empty boards to be filled are carried back on the lower portion of the wires. Circular knives suitably placed on the loading device cut the peat into pieces of convenient size.

149531—July 29th, 1913.

T. Rigby, Dumfries, Scotland.

Method and Apparatus for Gathering and Transporting Peat.

Assigned to the Peat Coal Investment Co., Ltd.

According to this invention the peat is cut from the bog and while containing about as much water as in its natural state in the bog, is subjected to maceration until reduced to a pulp of watery fluidity, whereupon it is pumped through a pipe line.

It is stated the applicant is the first to make feasible this mode of conveyance of peat from the bog, and his invention is based on the discovery that if excavated peat be disintegrated sufficiently to destroy its fibrous structure it may be conveyed as described without addition of extraneous water, the mass becoming sufficiently fluid by adequate disintegration.

The necessary equipment consists of an excavator disintegrator and pump suitably disposed on pontoons or otherwise, a fixed pipe line-line, and a flexible pipe between the pump and the fixed fixed point in a pipe-line, so that a more or less wide cutting can be made without any alteration in the pipe-line being rendered necessary.

"Claim:—1. A method of gathering peat according to which the peat is excavated from the bog, and while containing about as much water as in its

natural state in the bog, is subjected to maceration until reduced to a pulp of watery fluidity whereupon it is pumped through a pipe-line."

149532—July 29, 1913.

Thomas Rigby, Dumfries, Scotland, and Nils Testrup, London, England.

Process for the Utilization of Peat.

(Assigned to Wet Carbonizing Limited)

The object of the invention is to provide a process and installation capable of application on a large scale for utilizing peat by gasification in bye-product recovery gas producers.

In order to overcome the disadvantages incident to air-drying of peat, it is proposed to first reduce the moisture by means of filter presses to about 70%, and afterwards to disintegrate the partially dried peat, and to suspend the disintegrated material in hot products of combustion, to complete the drying operation to the desired extent, then to briquette the dried peat and gasify it in a producer.

179991—July 29, 1913.

Joseph Berglund, Eskilstuna, Sweden.

Process and Apparatus for Treating Peat.

The raw peat mixed with large quantities of water in such manner that the small particles become suspended while roots and other coarser material are separated by means of a continuously moving strainer is conducted into basins on the ground and left to dry. The layer of peat cracks in drying and without further treatment is claimed to form a good fuel.

ANENT "HOT AIR."

We are in receipt of a number of The Percolator, the bulletin of The Chemists' Club of New York for August 20th, 1913. Among other interesting contents we note a learned contribution to the Study of Flatus Caloricus or Hot Air by Mr. Ellwood Hendrick. The thanks of all Peaters are due Mr. Hendrick for this very illuminating discourse, from which we take the liberty of quoting:

> "We know that hot air is a product of the human animal, and that its most frequent modification is to be found in the exhalations of the breath while speaking."

"Hot air is distinguishable by what it is not, as well as by what it is. Thus, Truth, which I am also disposed to believe is a gas, is seldom found in hot air, although facts are sometimes present; usually, if not always, in an uncorrelated condition. H2 S and other mephitic gases are often present, but when we consider in what large measure hot air supports life, we must beware lest we assume too great a CO2 content. It supports life among lawyers in amazing measure, and it has been known to maintain chemists for considerable periods of time. Sir Oliver Lodge says of a gas that "it has neither volume nor shape," and this holds true of hot air."

"Hot air has a density, as every one must admit. Its transition points from a gaseous into a liquid form and again into a solid phase seem to be close together, for while few of us have observed liquid hot air, solid hot air is known to all. It is very frequently observed to cause a feeling of extreme weariness to those who, being surrounded by it, are forced to inhale it. It also, at times has a choking effect. Despite these mildly toxic qualities it cannot, as we have already observed, be regarded as a virulent poison, considering the measure in which it supports life. The ability to withstand it appears to be constitutional, some seeming to enjoy it, others being driven mad by it, whilst occasionally utter collapse follows its administration. Very frequently it appears to act as a catalyzer to anger bodies, which in turn gives rise to a desire to punch the head of whatever Emitter may be present. There seem to be no changes in the vapor density of hot air above the temperature of 1000°C. In fact, this temperature is recommended on occasions of hot air poisoning, and is invariably effective if the hot air exhaler or emitter is plunged into it."

"The question has arisen whether there may occur an emanation of hot air from the written or printed page. Without going into detail, we may say that indications point to it."

"Although no instrument of precision has been devised to measure it, its presence may be determined qualitatively by a physiological laboratory test. The following method is recommended:

"A human animal is placed in an upright posture in an ordinary chair or settee. No anesthetics may be given. All reading matter, newspapers and books are removed, and an active hot air emitter is brought into the laboratory and placed in close proximity to and facing the human animal. The emitter is encouraged by psychological means to talk intently. Evidences of fatigue and distress will shortly appear in the human animal and expressions of despair and cries for help on its part will indicate the certain presence of hot air."

Peaters will readily recognize the accuracy of Mr. Hendrick's determination of the phenomena attending emanations of hot air. One form of re-action which he has overlooked will be familiar to peaters, and we believe is not unknown to those engaged in other lines of industrial activity. We refer to the fact that after long continued and copious emanations of hot air there has frequently been observed a serious and sometimes alarming shrinkage in the bank accounts of those exposed to its mephitic influence.

The peat industry has in the past suffered severely from "hot air" of the variety under discussion. Whether it will ever be commercially practicable to supersede open air drying of peat fuel by any combination of pressure and artificial drying is a moot point. If it were possible to supplement the combustion of fuel by drawing on the copious supply of "hot air", the results might be surprising. The optimistic inventor and the more or less unscrupulous promoter we have always with us.

PRODUCER POWER PLANTS.

The United States Bureau of Mines has published a study of the producer-gas plants using anthracite. Such a plant has large conservation and commercial possibilities. Government experiments for eight years have demonstrated not only a very low fuel consumption per horsepower hour, but also the possibility of utilizing commercially low grades of bituminous, lignite and peat.

There are in present use engines with aggregate capacity of 200,000 horse-power deriving this power from producer gas. Engines with power from blast furnace and coke oven gas aggregate 350,000 horse-power. The latter type is largely in steel works, the power being used for mills and furnaces.

There are producer-gas plants in 46 States, the District of Columbia and Alaska. From 1909 to 1912 such plants increased from 474 to 722, or 52 per cent. Horse-power increased from 11,250 to 187,140, or 68 per cent. Plants using anthracite increased from 415 to 610 and their power from 48,100 to 89,470; those using bituminous from 37 to 77 and power from 54,150 to 86,605; those using lignite from 23 to 32 and power from 9,000 to 10,230.

The producer-gas power plant has proved economical in obtaining power and in using fuels such as peat and lignite. Texas in 1912 had 28 producer-gas power plants, of which three used bituminous coal, six used anthracite, and 19 used lignite.—The Canadian Engineer.

PEAT IN NORTHWESTERN QUEBEC.

In the vicinity of Laval and McGill lakes, peat has accumulated to great thickness; for considerable distances the shores are margined by banks of this material up to six feet high, and in places the clay basement upon which the peat rests is not exposed. Between these lakes and the great northern bay, near the western end of Matagami lake, the land is very low. Since locally peat also appears upon the shores at the bottom of this bay, it is highly probable that very large percentage of this low intervening area is occupied by heavy deposits of peat. Similar deposits of peat must be of frequent occurrence between Laval and McGill lakes and the western shores of Soskumika lake. They also occupy a considerable percentage of the flat area in the vicinity of Kelvin lake. Less extensive peat bogs were observed in places along the western shore of Matagami lake, and on Elizabeth bay of Olga lake.- Extract from a report on the Geology and Natural Resources of certain portion of the drainage basins of the Harricanan and Uttaway rivers, to the north of the National Transcontinental Railway line in Northwestern Quebec, by J. Austen Bancroft, April, 1913).

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PEAT MOSS.

SOME OF ITS USES, ITS MANUFACTURE, ITS FUTURE ON THIS CONTINENT.

By W. F. Todd, St. Stephens, N.B., Canada.

The best peat moss bogs are made up almost wholly of sphagnum moss, the variety Fuscum. This species has the greatest absorptive power and longest life when used as litter. In Europe and perhaps on this Continent, most of the sphagnum bogs, whether dead or living, will make peat moss litter and mull from their upper layers, and peat fuel from the lower layers. The quality of this peat moss will be determined by the age of the bog, its degree of humification, and the variety of sphagnum which makes up the greater part of its substance.

I am informed that in Europe, it is very rare, if ever to find a bog that is purely a peat moss bog, i.e., suitable for moss litter from top to bottom. This may be the case in many parts of Canada and the United States. But the bog upon which I did most of my experimental work, is a raised sphagnum bog, and purely a moss-litter bog. Other bogs that I know of in this and the adjoining county are of the same character, and among the finest to be found anywhere. The best peat-moss bogs are near the seaboard, where the fog and dampness gives them their fullest and most luxuriant growth. Very little, if any bush growth is upon them, and because of the Eriophorum or cotton grass amid the sphagnum, the bogs have the appearance as you approach them of old run out grass fields. The description of bogs generally as to their composition, their kind, and their plant growth, has been written so well and thoroughly by others and so often read by all who are interested in peat matters, that it would be but a waste of time for me to refer more than I have done to these points. But in the future of the moss-litter business when competition shall have become keen, purchasers will be governed by the cleanliness and absorptive powers of the samples brought before them, and select that of the higher merit, if the moisture content is alike. Therefore it behooves one who intends to manufacture litter alone, to select a bog of the highest quality.

Among the many uses of peat-moss written of, I would choose as the two best and most important uses of Peat-moss: First, for sanitation; second, for litter purposes.

Peat-Moss for Sanitary Purposes.

It must be in a fairly fine powdered state to give the best results. In this state it takes up liquids and gases more quickly than if larger lumps or particles were used. It is a maxim of sanitation that a dry system of sewage removal is the best. Earth has been found unsatisfactory. Peat powder is a perfect medium in which to attain this proper sanitation. The wet or waterborne system of sewage removal, with its deadly danger from sewer gas, and its pollution of the water courses, through which it flows, will have to be endured in cities and towns, until saner regulations bring the hygiene of sanitation to a better and more perfect state. Peat-moss or peat powder will kill infectious germs and destroy bad odours, without leaving another in its place. To those living in towns, villages and the country districts, the use of peat-moss powder, through dry closet use, will prove a great boon in the way of comfort and health to the people, to say nothing of the great saving it will make to agriculture. Peat moss powder has a complete deodorising power, with disinfecting properties. It has the greatest power for absorbing liquids and fixing gases. It resists putrefication and fermentation until mixed with the soil bacteria. In the case of epidemics, capable of being spread by the germs present in the excreta, this powder will hold fast these germs, if not entirely destroy them, and if there should be doubt upon this point, a 3% solution of sulphuric acid mixed with the powder will kill all infectious germs contained. To whatever applied peat-moss powder stops putrefication, destroys odours, and keeps away flies, which now, our best authorities agree, cause the spread of many infectious diseases.

Peat-Moss as Litter.

In 1887-88 I placed upon my stock farm a large number of valuable trotting bred horses for breeding purposes. Upon some of the stock farms I visited, at that time, I noticed that imported peat-moss bedding was used. I was attracted by it, and began at once its use in my stables. I was more than pleased with its good qualities, and in my experience with it, I never found one single point against it. Indeed, so enthusiastic did I get from its use, that I set out at once to find deposits of a like material in my own neighborhood. This was the start of my enthusiasm in peat-moss and its manufacture, an enthusiasm and hope that has never waned, in spite of all the bitter reverses and setbacks I have had. In my use of peat-moss as bedding I have proven the following facts; that one ton of a good peat-moss will last as long as two and one-half tons of straw, and that in a box stall, (if bedded and seen to properly)

one bedding could easily be made to last three months. On my farm in one box stall, I used one bedding of peat-moss before removing thirteen months and six days. I was making a test of it. In all that time no disagreeable odour arose from it. In the handling of at least 150 horses and colts on bedding of peat-moss, I knew but one horse that would eat it, and this was one of my farm work horses, with a morbid appetite that craved mud, muck or anything of that nature. The eating of this bedding for weeks never had the least deleterious effect upon him. This material is highly conducive to a healthy growth of the hoof and I cured the worst case of thrush I ever saw on this bedding. A horse can be kept cleaner and healthier on this bedding, with a quarter less labour than when straw is used. No drainage of the stall is needed. No ammoniacal or other odour from it, but always a sweet smelling stable. No dust if bedding directions for its use are followed.

There are two great claims that I can truthfully make for the use of peat-moss bedding, and which I have never seen mentioned by others. One is the fact that flies will not harbour in it, or breed about it, and wherever it is used wholly in a stable, you will find very few if any house flies. This is a great boon, as the house fly is now looked upon as a great menace to health in its power to carry disease germs. This freedom from flies is brought about partly because the peat-moss in itself is repugnant to them, because of its powdery condition, and partly from the fact that there is no food whatever in it for them. But this freedom from flies in summer can only be attained by removing the droppings of the animals three or four times a day and burying them under a slight covering of the used peat-moss. Otherwise flies will lay their eggs in these droppings, which in a few hours will hatch out unless stopped by the peat-moss.

The other great claim I make for the use of peat-moss bedding is its perfect freedom from danger of fire. You may explode a lamp or lantern upon it and you cannot set it on fire. The kerosene will burn out, and leave nothing but a slightly charred place where the oil burned. I have tested this again and again. I have lighted armfuls of newspapers on the bedding, but could never get the bedding to burn. I would rather have one pailful of peat-moss bedding well fired, to smother flame, than two pails of water.

When you consider these safeguards in its use, and how clean and healthy an animal can be kept on a bedding of this material, you can judge that a large use of it will grow up in this country. By repeated thermometer tests in winter I have found peat moss bedding two to three degrees warmer than a straw bedding. The best agriculturists of the past, and those of the present time state that the condition most needed to ensure certain and good crops is sufficient moisture throughout the growing season. With a great lack of humus in our soils, how can we hold and conserve moisture after our rains. I hold that the use of peat-moss manure will best and most quickly give this result

when plowed into the ground. From the poorest to the very best peat-moss the range of absorption is from 8 to 28 times its own weight. The peat-moss particles become loaded with the water that percolates through the top sod during a rain storm. This moisture is given up to the crop roots very slowly and gradually, when the upper layer of the soil dries out by surface evaporation. Thus by its use, a drought will be robbed of its deadly power, heavy soil be lightened and made more permeable to air and water, while sandy and light soil will be made retentive of moisture. Peat-moss bedding, after use under animals, makes a splendid fertilizer to apply to all crops. It contains, to start with, twice to three times the nitrogen content of the best barnyard manure. It locks up perfectly all the liquids from the animals (which is two-thirds of the total manurial value of the excretions) and only gives it up when mixed with the soil and fermentation takes place.

Moss litter will be found the best and cheapest bedding for animals. Horses and cattle, when bedded upon it, can be cleaned with very much less labor, and the stalls cared for in one-fifth the time it takes when straw is used. It keeps the hoof in splendid condition, and is highly conducive to its quick and healthy growth. It is very cleansing to the skin, and a white or grey horse will never show a stain when bedded upon it. It will not take fire. It is a perfect deodorizer and disinfectant, killing cholera and other deadly disease germs immediately. Thus it proves one of the best safeguards against disease to those working about it. As a fertilizer it is unexcelled, and entirely free from disagreeable odours that usually arise from highly concentrated manures.

Directions for Using Moss Litter.

By observing implicitly the following directions for using moss litter as bedding, the best satisfaction and economy will be found and the greatest pleasure will ensue from its use:

Make the bed at least 6 inches deep.

Take the droppings out three or four times a day by laying a basket on edge and scraping same into basket with a shingle or other piece of light wood. This is easily and quickly done and adds very largely to the last or wear of the bedding. After the first two or three weeks use, when the bedding should get a little moist on top, take a three or four pronged fork every morning, after the droppings are removed and before the horse is returned to the stall, and plow the moss (by shoving the fork before one) bringing the bottom moss to the top, then with a short handled rake, smooth the bed down and it is done for the day. If there should be a very wet spot at any place in the bedding take this out and throw to the edge of stall, in case of a box stall. But in a narrow, standing stall the wet place had better be removed entirely and a shovelful of new moss put in its place. Follow this course every morning and the bedding will last week after week and form a fine, soft bed. Close all

sewers leading from stalls when moss litter is used, as it absorbs every particle of liquid, and any loss of liquid injures its fertilizing value. When used in narrow stall use a piece of plank or deal behind to keep moss in if so desired. Should moss, when first spread be a little dusty at any time, give it a light sprinkling for a few mornings with a watering can, and it will then wear for weeks without any further treatment in this particular. After using it can be put in any basement cellar without risk, as it never steams and will not rot the timbers or woodwork. It will last as a bedding from three to six months in a box stall, according to the season of the year.

In a standing stall, where the animal is tied, you do not need as thick a bedding, although it should not be less than four inches deep behind the animal. This, so that the liquid voided cannot go clear through to the floor, and be wasted for agricultural use, by passing into the wood of the floor. A standing stall requires a piece of scantling say 2 inches or 3 inches by 4 inches at end of stall on the floor to keep the bedding from spreading out on the stable floor. This can be made with beveled edges so as not to trip the animal when passing in and out, and be more comfortable if any part of the rump of the animal should reach it at any time when resting at night. Any user of litter can easily arrange this. No drains are needed, and if a strainer pipe is in the stall to take away the liquids put something in and over it to keep any of the bedding from passing down. The bedding absorbs every particle of the liquid and drainage is needless as you can well see. If any one is building or repairing stalls, by all means advise them to put in a cement floor and cement sides up 8 inches. This will make a permanent, lasting work.

I feel sure that the use of peat-moss on this continent will increase by leaps and bounds when its good qualities are preached to the people, and manufactories start up and meet the future demand. This continent with 110 or more millions of people are using but 8,000 tons of peat-moss, while Great Britain alone, year before last used 180,000 tons.

This should not be, and I prophesy that the next few years will see a great change in this respect and the products of our peat-moss bogs will be called for from one end of the land to the other.

CANADA'S PEAT INDUSTRY.

By J. G. Adams, B.A.

(From The Journal of Commerce).

Canada's peat industry has become an economic factor of commercial importance. It has passed beyond the experimental stage and is now on a basis for extensive development. As yet the enterprise is but in its infancy.

but with almost unlimited raw material in various parts of the Dominion and a method of manufacture and preparation which is successful financially and mechanically, it remains only to create a demand for the product by advertising its qualities as a fuel and showing that it is cheaper than anthracite, to create market conditions which will insure the interest of capital in its development and create an expansion which the importance of the problem justifies.

In these days when one and all are complaining of the high cost of living, when the industrial man excuses the high prices of his produce by the increase in prices of his raw material and of the accessory material for its manufacture, when the household is complaining of the apparently exorbitant prices of the home necessities, it is of importance to note the introduction of any material which will tend to relieve the pressure by reducing expenses. That peat is a less expensive fuel than anthracite or other varieties of coal and quite as suitable for industrial and domestic purposes, has been demonstrated by exhaustive experiment.

As a country Canada is dependent on the foreign supply for a high percentage of her fuel. Her wood supply is rapidly becoming exhausted and falls short of supplying even the demand for domestic fuel. With coal areas situated in the extreme eastern and western portions, which as yet, furnish only a limited supply of fuel, the central portions of the Dominion are almost entirely dependent for their fuel with which to promote industrial development or to supply home comforts on the republic to the South. During the year 1912 Canada's coal mines produced 14,699,953 tons, while during the same period 14,574,899 tons of anthracite, bituminous and dust coal were imported from the United States.

The above figures show the total amount of coal imported, or in other words we are entirely dependent on the United States for approximately 50 per cent. of our fuel supply. For this supply we paid $39,468,467, or Canadians gave almost $6.00 per capita during 1912 for this one imported article.

Under such circumstances it surely behooves us to inquire into the question of our natural resources to find if some remedy may not be found for conditions so undesirable industrially and economically.

The most promising means of relief lies in the development of our vast peat fields. It is estimated that some 40,000 acres of bog have been surveyed or explored in different parts of the Dominion and this is thought to be only a fraction of the total. The southern boundary of the peat area may be said to be a line drawn from the Atlantic Coast in New Jersey through northern Pennsylvania, Ohio, Indiana, and Illinois, Wisconsin, and Eastern Minnesota, which passes into Canada through Western Manitoba. Crossing to Alberta, it curves southward, passing through southern British Columbia and entering Washington, U.S.A. North of this line there is an almost incalculable amount of peat between the Atlantic and the Pacific, much of it still unknown. The

largest bogs known lie east of the Great Plains in Ontario and Quebec. It has been found as far north as the Churchill River and at the southern border of the Barren Grounds. Over this area the peat averages possibly 20 feet in depth, and when it is remembered that one acre of peat one foot deep will yield approximately 250 tons, or that an acre 20 feet deep will yield about 5,000 tons, one may understand, in some small degree, the importance and value of this almost unlimited supply of fuel.

It is quite generally known peat is of vegetable origin, and the bogs are really ponds or lakes which have been filled with decaying vegetable growth, which now varies in depth from one inch to sixty feet, and under natural conditions is now found covered with a mantle of moss and other smaller vegetable matter which may or may not be accompanied by a growth of shrubs or of tamarac and spruce trees. Under natural conditions the bogs usually have a certain amount of surface water which may be permanent or only periodical and this makes drainage a necessary prerequisite to the digging of the peat.

After this surface water is removed a large percentage still remains, part in mechanical suspension and part in chemical combination. It is estimated that as much as 80 to 90 per cent. of moisture is retained in the natural peat by these means and the method of manufacture which can most economically and most successfully remove 60 to 90% of this moisture is the one which receives most favor among those interested. The solution of this problem has developed many variations of three main methods of manufacture which are known as first, the dry process, by which the raw peat is collected either in its natural condition or after a partial air drying, the water reduced to a suitable percentage by artificial means and the product briquetted by pressure; second, the wet process, in which the peat as collected and before drying is thoroughly ground and puddled, moulded into bricks or any desirable form and then dried; and, third, methods in which the moulding or briquetting of the peat is omitted.

The value of the product and the ultimate necessity of developing the peat areas has led many individuals and companies to formulate methods and attempt the production of peat fuel on a commercial scale during the earlier history of the industry in Canada. Much money, thought and energy were expended and many plants erected in an endeavor to solve the problem. But owing to lack of experience and of sources of information as to methods, etc., most of the enterprises proved to be failures either commercially or mechanically, or perhaps in both respects. With a view to the preventing of any further futile expenditure on the part of private investigators the Dominion Department of Mines about 1907 appointed an engineer to investigate conditions and methods of manufacture in Europe where the industry had already been placed on a successful working basis. The report submitted showed, first, that for the economic production of fuel from peat, machinery driven by power must be substituted as far as possible for manual labor; second, that processes, so

far invented, for removing the water content of the peat by pressure and artificial heat have not led to commercial results, and after trial have been abandoned.

Dr. Haanel, speaking before the meeting of the American Peat Society in Ottawa in 1910, said:

"The endeavor to accomplish economically, by artificial means, and in a short time what has been accomplished by nature in exceedingly long periods of time, namely the change of peat into a substance similar to coal, has so far, apparently not been attended with success. I would not like to say that it cannot be done; since it is unsafe to many any statements regarding the possibility of future achievement; but at present the outlook in this direction is certainly not encouraging. In view of these facts, the only proper course for us in Canada to follow, if we desire to establish a peat industry and render ourselves, at least to some extent, independent of outside sources for our fuel, is to introduce such processes and such machinery as have proved successful and are now in actual commercial operation in Europe. It was with the view of introducing these methods in Canada and of showing that they were adaptable to Canadian conditions that the government purchased a bog of 300 acres at Alfred, Ont., and began the manufacture of peat by methods which had been found to operate successfully in Europe."

Without giving details of manufacture by the two methods, namely wet and dry processes, it will be sufficient to show some differences in the finished product, which show decided advantages in favor of the wet method, and which coupled with advantages in manufacture have served to bring about the adoption of this method in Canada. The following differences in the peat produced by the two methods are noted: First, the dry process fuel is not so dense as the wet, i.e., more fuel is contained in a given volume of wet process fuel than in the same volume of dry process.

Second, the dry process of pressure peat consists of unaltered particles of vegetable material. In the wet process the fuel is a homogeneous mass in which all traces of its vegetable origin have been destroyed.

Third, another difference which follows directly on the preceding is that dry process peat is hygroscopic and will disintegrate within a few hours or a few days if exposed even to a damp atmosphere and in water will soon return to its original form. The wet process fuel will not take up any appreciable amount of water. Pieces have been immersed in water for a year and although softened on the outside have remained intact. But in no case is it possible to reduce it to its original wet and plastic form.

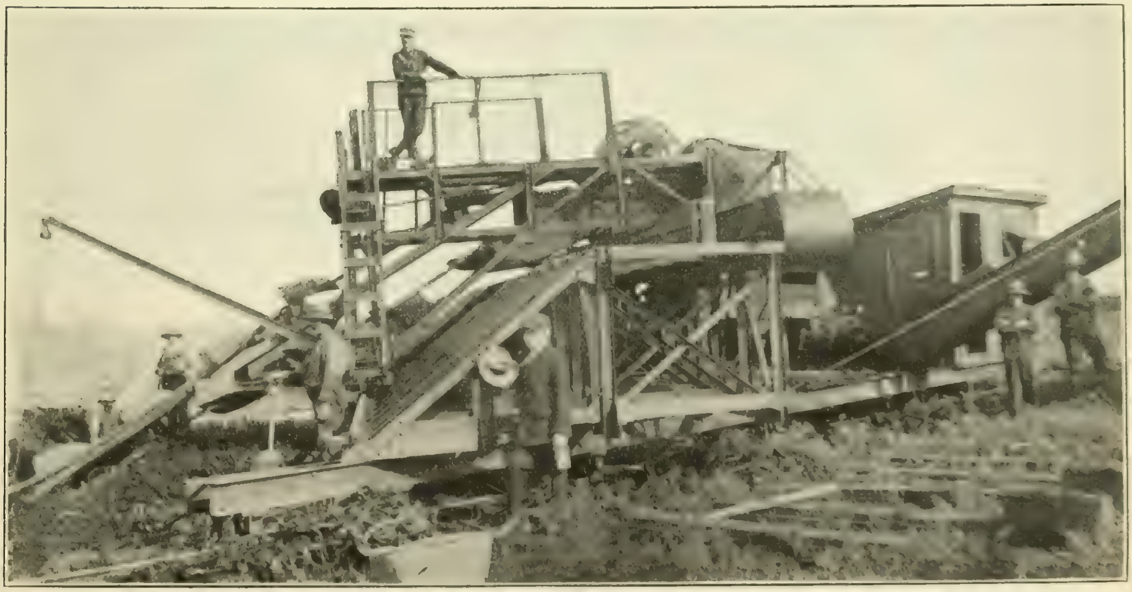
Fourth, the dry process peat burns very unsatisfactorily. Owing to the breaking down of the briquettes in an ordinary stove a great deal of glowing ash and fuel falls into the ash-pan, causing much waste. Special stoves or grates are necessary therefore to hold the ash until combustion ceases. The

wet process fuel in contrast burns in a most desirable way. The combustion beginning on the outside of the briquette works gradually towards the centre, but all the while the block retains its original form and when consumed undisturbed the block of ash is a "practical duplicate of the block of peat." Moreover when in the fire it will stand almost as much pressure as anthracite.

The destruction of the cells in the wet process explains the difference in hygroscopic qualities of the fuels. In the dry process fuel capillary attraction and the presence of innumerable vegetable cells explains the rapidity of the taking up of moisture. And in burning, this fuel consisting of an infinite number of cells from which the water has been pressed and which are now filled with air, is fractured by the heating of the air in the interior and the block falls apart as has been mentioned.

The process employed on the government bog at Alfred, Ont., is a variation of the wet process method and as has been stated has been installed after full investigation into the most successful European methods. The plant consists of five separate units namely, the Power House, the Excavator and Macerator combined, an overhead Cableway, the Spreader and the Harvesting equipment.

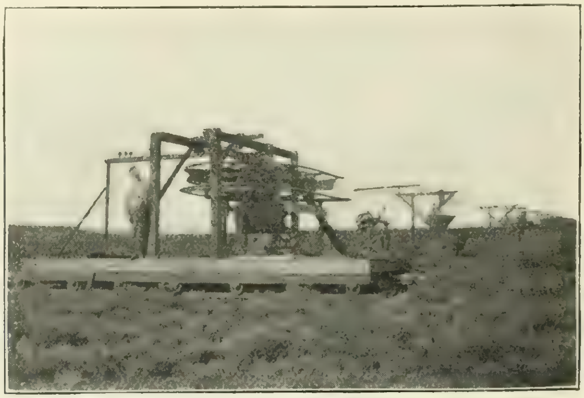
The power house is at a distance of about a quarter of a mile from the bog proper. The essential equipment consists of a large 80 or 90 horsepower tubular boiler which is fired entirely with peat; a 13x30 inch Corliss engine used to run an alternator and its exciter. These are connected with a switchboard and the



MECHANICAL EXCAVATOR AND MACERATING MACHINE EMPLOYED AT ALFRED, ONT.

usual measuring instruments. The 2200 volt current developed is carried to the working field of the bog and used to run the machinery in use there.

The excavator and macerator rests on a primary car supported by three sets of wheels on three parallel tracks. The rails of these tracks are in sections and the ties are so arranged that the whole machine may conveniently be moved forward as digging progresses. The car also supports a step-down transformer by which the 2200 volt current is brought down to 550 volts, from which it is distributed to drive the macerator, the excavator and cableway, and spreader. The rear of the car also supports a steel bridgework supporting two parallel rails, on which is mounted the traverser, which travels slowly backward and forward on the parallel rails. The excavating element is supported above by the traverser and below by an arm, the outer end of which can be raised or lowered to regulate the depth of excavation. When operating, the primary car remains stationary, while the traverser travels from one side to the other. The car is then moved ahead about eight inches and the traverser makes its return trip to the opposite side of the excavation. The peat from the excavator is dumped into a trough from which it is delivered into the macerator. From the macerator the peat is propelled by a 16-inch spiral conveyor to a loading hopper situated on the inside end tower of the cableway which conveys the peat to the spreader.



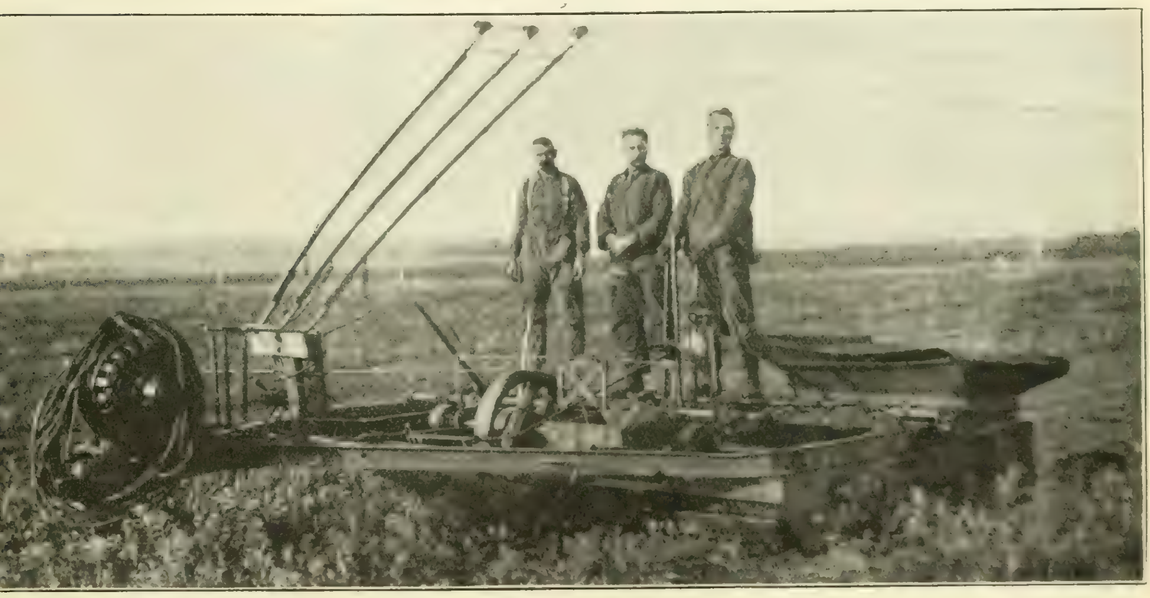
CABLEWAY FOR TRANSPORTING PULPED PEAT FROM MACERATOR TO SPREADER ON DRYING FIELD, ALFRED, ONT.

The cableway* consists essentially of two towers placed about 900 feet apart and so supported on wheels resting on rails held in place by ties of peculiar construction that they can move only in a direction at right angles to

*This cableway is not used on the plant of The Peat Industries Limited, at Farnham, Que., but the peat is conveyed from the Macerator to the Spreader in small dump cars running on a specially constructed track which may be moved sidewise as the peat is spread over the surface in order that the track may be in line with the Spreader.

a line drawn from one tower to the other. These towers support two parallel cables and on each tower connecting the ends of the cables are semi-circular tracks forming a continuous and endless single track. Between these end towers are light wooden supports every 75 feet mounted similarly to the end towers. Steel buckets travelling on these cables are operated by a system of drums and pulleys run by a 10 H.P. motor fixed on the inner tower. These buckets deliver the peat to the spreader.

The spreader is essentially a box having the peat dumped into one end and uniformly distributed throughout by special screw conveyor. It is discharged from the box again by thirty-four moulding spouts, each of which is fed by a separate conveyor. The whole arrangement is hauled by a small tractor at a rate of about 84 inches per minute. This spreads the peat on the ground in



MACHINE FOR SPREADING PULPED PEAT ON DRYING GROUND AND CUTTING PEAT INTO BLOCKS, ALFRED, ONT.

thirty-four rows, 4 inches wide, and 4 inches thick. An attachment is fixed to the rear of the spreader which cross-cuts these rows every eight or ten inches as desired.

The fuel is left on the ground in this condition in parallel rows about one foot and nine inches apart for a few days or a week, depending on the weather, after which it is piled by hand into little piles and when dried down to 25 per cent. water content is ready for shipment.

The finished fuel is in the form of bricks about 2x4x8 inches, a very convenient size for handling. Its merits as a domestic fuel when compared with

anthracite show it to be equally serviceable and more economical. Peat will average from 10,000 to 12,000 B.T.U. per pound while hard coal usually gives 14,000 to 16,000 B.T.U., but in practice the available heat units are much greater proportionately than in coal, because the waste in peat is only 4 to 5 per cent., while that in coal runs from 16 to 26 per cent. Furthermore, the cost of pro-

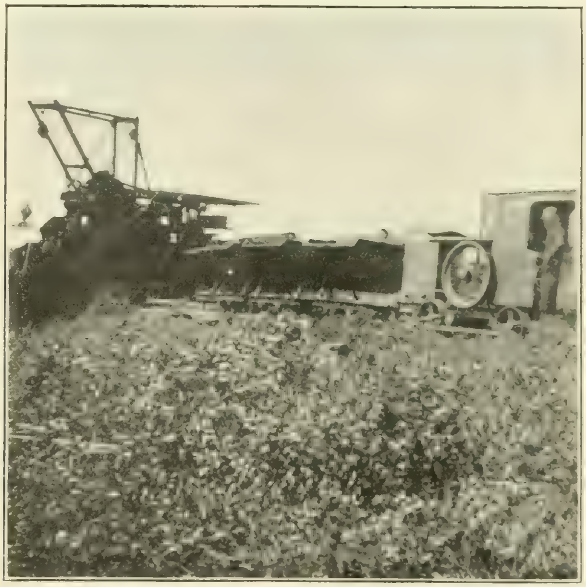
PEAT LAID OUT FOR DRYING AT ALFRED, ONT. PLANT

duction has been so minimized by the study of conditions and the elimination of all wasteful factors, such as unnecessary manual labor, etc., that peat can be sold at $4.00 to $5.00 per ton, and at the same time give a profit on the capital invested. These prices are from $1.00 to $2.00 below the average price for coal and consequently this fuel should prove attractive to the consumer for financial reasons.

It has been our aim in this short article to give some account of the desirability of peat for a domestic fuel only. That it has a far wider field of usefulness is proven by the investigations carried on by the Department of Mines at Ottawa to learn something of its utility for power production. These experiments have shown that it is an economical and efficient source of fuel for the production of producer-gas. Lack of space forbids the giving of details, but those desiring information are referred to the Report on the Utilization of Peat

Fuel for the Production of Power which may be obtained from the Department of Mines, Ottawa.

As can be readily seen, the amount of fuel produced each season by such a method as outlined above must depend in a large measure on the season and on weather conditions, since the manufacturers depend almost entirely on the sun's heat for suitable drying. The length of the period suitable for excavation during an average season is estimated at 100 to 112 days. This may seem to indicate a limited and fluctuating supply which could scarcely be depended on to supply any extensive market. But just as soon as market conditions warrant it an extension of the plants might easily more than supply any demand which might be created.



EXCAVATOR AND CARS USED IN CARRYING PEAT TO SPREADER AT FARNHAM, QUE.

The principal plants in operation at present are the Government plant at Alfred, Ont., and the plant of the Peat Industries Limited, at Farnham, Quebec. Other bogs near London, Hamilton and Brockville have been partially developed, but owing to the want of a successful method of preparation most of the work in these places has been stopped and the plants abandoned. Now that a successful means of production has been evolved an expansion should be seen in the development process and many of the other extensive peat deposits should be made to contribute to the maintenance of a supply of a cheaper and serviceable fuel for Canadians who should welcome it as a relief from the burdensome coal tax. Further development depends solely on commercial enter-

prise and the interesting of capital in the project. This should not be a difficult task since the value of the fuel is unquestioned, the raw material is almost

PEAT BEING "STORED" AWAITING SHIPMENT

unlimited, and the demand must grow as prices of coal increase and its value as a fuel becomes more widely known.

See editorial comments on the above article on page 21.

ELECTRIC POWER FROM FUEL AT MINES.

Excerpts from an Article by George E. Edwards in the Mining and Engineering World, November 15th, 1913.

The possibility of generating power directly at the mine mouth and not only using it locally but also transmitting electric current over long distances, is a subject to which considerable attention is now being given, and a number of plants for the purpose have been planned, particularly in districts where coal, iron ore, and metal mining operations are not far removed from one another.

Thus far the most conspicuous success in carrying out this idea has been attained by the Maritime Coal, Railway & Power Co., Ltd., whose headquarters are at Amherst, Nova Scotia. This concern has constructed at its Chignecto mines, 9 miles distant, a steam plant for the generation of electric power and its transmission to users at a distance, in the same manner that hydro-electric energy is disposed of.

The plant has now been in service for over 6 years and its operation has

demonstrated the practicability of converting the thermal energy of slack or refuse screenings into electricity for sale in distant markets. The demand for its output has constantly increased; and today the installation is the source of electrical supply for the municipalities of Amherst, Maccan, Nappan, River Herbert, Joggins and Chignecto, operating motors and a lighting system in each of these communities. Factory machinery, a gypsum quarry, pumps, blowers, hoists, fans and other equipment are included in the motor load, and by the use of an otherwise unmarketable fuel, which constitutes about 30% of the mine output, the plant is enabled to deliver electricity at economical prices throughout the district.

At the time that the Company began to mine the Chignecto seam it was found that the top seam was divided from the bench by a soft ply from 6 to 8 inches thick. In the mining process it came out in the form of culm and was extremely dirty. During the screening this material became mixed with the slack, lowering the quality of the latter to such an extent that the slack was of very little market value on account of the large amount of ash present. It cost the Company about 10 cents per ton to dispose of the material, so that the saving in converting the fuel energy of this cheap grade of coal into electricity is much greater than if a good quality were used, as the rate per ton for conveyance to the boiler room is the same in both cases. The fuel used at the plant could not be sold on account of its quality, and the space for banking was limited to an area close to the mine.

The power plant is a 75 by 100 feet brick and steel structure, with concrete foundations, and is located within about 100 feet of the colliery bank-head, fuel being delivered to the station from screens at the bankhead by a Jeffrey motor-driven conveyor. Robb, horizontal return tubular boilers of 1550 h.p. are in service, four batteries being installed. Two sets of blower engines and fans are provided, either being capable of giving 5 ins. of draft in the ash pit with all boilers in operation. Natural draft is also supplied by a steel stack 60 ins. in diameter and 40 ft. high. The fuel burned averages 20% ash, and when using the culm and refuse the fires have to be cleaned every 2 hours. The grate areas of the boilers were designed for 49 sq. ft. each, somewhat above the usual practice on account of the poor quality of the fuel.

Three-phase generators aggregating 125 kw. are at present in service, being direct-driven from 17 and 33 by 16 in. Robb Armstrong vertical, center-crank, cross compound engines, operating at 300 rpm., on a 26 in. vacuum, the units having direct-connected exciters. These engines are among the largest vertical type machines ever built in Canada, and are designed for automatic governing within 3% maximum on momentary changes of load.

The generators are of the General Electric type, one being wound for 220 volts and the others for 11,000 volts. Sixty-cycle current is delivered from each unit to a main switchboard.

The local load at Chignecto is handled by a 2200 volt service. From the power house two 11,000 volt overhead lines are run separately to the principal centers of distribution at Joggins and Amherst, each line being No. 4 B. & S. copper, carried on 15,000 volt porcelain insulators, supported on 30 foot wooden poles, spaced 125 feet apart. The pole lines are each designed for a second circuit.

The Joggins line is about 15 miles long and supplies the Joggins, Maccan and River Herbert district. All the machinery at the Joggins Mines is now electrically operated, distribution being at 220 volts alternating current. The largest motor on this line drives a ventilating fan for mining service. The Amherst line supplies energy for all the lighting and motor service in the town, and from this transmission circuit a tap is taken off at Nappan for the Maritime Gypsum Co., a modern sub-station for voltage conversion and local distribution being situated at the south of the quarry.

On the upper floor are placed self-cooling transformers reducing the potential to 2400 volts for local use, fuses, switches and low-equivalent lightning arresters. The lower floor contains 2400 volt oil circuit breakers, controlling the local feeders.

The operation of the Chignecto plant requires a force of 10 men. Two shifts are run, these being 13 and 11 hours in length. With alternate, the fire room requires two firemen, one ash wheeler and one man to blow out tubes and clean the boiler combustion chambers. At night two firemen and an ash wheeler handle the service. In the engine room the chief enginer and an assistant engineer handle the day load, the night shift being carried by one assistant engineer. The labor requirements are somewhat increased by the care needed to burn successfully the poor fuel offered, without decrease in steam pressure. The installation is at present producing energy upon a fuel consumption of about 6 to 6.5 lbs. per kw. hour. About 60 tons of refuse slack is burned per day.

(The utilization of peat fuel in gas producers, with or without recovery of by-products, to generate electric energy for distribution to near-by districts, is undoubtedly one of the most promising fields for the development of our peat resources. At Pontedera in Italy, at Oldenberg in Germany, and other points in Europe installations of this kind are in successful operation.

There are many bogs in this country situated where coal supplies are costly, and hydro-electric power is not readily available, which might be utilized to great advantage to supply electric power within a convenient radius, and thus supply with cheap power communities which must otherwise remain for a long time or altogether without its benefits. This is a phase of development of the peat industry which is well worthy of careful study and investigation.—Ed.)

THE "MOORE" PATENT WATER-JACKETED GAS PRODUCER WITH BY-PRODUCT RECOVERY.

Translation of Excerpt from Article prepared by Dip. Ing. Gwosdz, Charlottenburg, and published in German Technical Journal, "Gluckauf," of 21st June, 1913.

The Dowson & Mason Gas Plant Co., of Manchester, have been thoroughly testing for some years back a type of Gas Producer for the recovery of by-products, designed by Moore, and according to reports we have received, have obtained with it results which show very remarkable advances as compared with the usual Mond gas plants. The method which has been designed to effect this is surprisingly simple. It consists in the middle and upper zones of the Gas Producer being strongly cooled from without.

The main idea of the Moore process consists in preventing the decomposition of the ammonia formed in the Producer without the introduction of excessive quantities of steam. For this purpose the ammonia formed is protected against decomposition only by the outer cooling of the Producer above the combustion zone, whilst the steam required for the formation of the ammonia is introduced under the combustion zone only in such quantity as is necessary for the formation of the ammonia. We therefore distinguish three zones in the Moore Producer, which stand in a definite relation to each other. The first and uppermost zone is cooled on the outside by air and has a temperature which is lower than that in the usual producers (in the mean about 180° C.). The second zone, which is cooled by the water jacket, has a mean temperature of 300 to 450° C., whilst in the third and lowest zone a temperature of 800 to 1,000° C. prevails. As soon as the temperature of 450 to 500° C. is reached, any further protection of the ammonia by steam is saved. This explains why the steam can be kept so very much less in the new process as compared with the Mond process.

On account of the smaller quantity of steam introduced into the gas producing zone, a relatively higher temperature prevails, the gas possesses also a higher CO content.

The gas carries with it very much smaller quantities of steam than the ordinary Mond gas, it is much easier cooled; the auxiliary plant is also much simpler. The cooling of the gas is effected in a series of tubular coolers, with which the outer air comes in contact, after which it is freed from the tar in a tar separator, of the Pelouze-Andouin type. The ammonia is not separated by means of sulphuric acid, but in two scrubbers, placed one behind the other, as ammonia liquor. The ammonia liquor can be worked up into various salts, which are of a white colour, in contrast with the mostly tar-coloured ammonia

sulphate of the Mond plants. With the old process the same method of working would not pay, as owing to the large quantities of steam to be thrown down with the ammonia large quantities of cooling water would be necessary, which in conjunction with the water to be separated would cause a strong dilution of the ammonia liquor.

According to information received from the makers, it is possible, by reason of the conditions mentioned above, to operate a gas producer plant of the Moore design with a capacity of about 300 H.P. and upwards with profitable results on the recovery of the by-products. When we consider that with Mond plants this is possible only with a capacity of 4,000 H.P., we are justified in regarding the new type of gas producer very hopefully. The German industry, which hitherto has shown little inclination to take up the Mond system of gas production, will doubtlessly follow with great interest the further development of the Moore improved process.

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The article by J. G. Adams, B.A. on "Canada's Peat Industry" in the foregoing pages contains a few statements which require to be corrected.

Thus the area covered by peat is stated to be 40,000 acres which have been surveyed, having an average depth of 20 feet. The total area covered with peat which is known to exist, scattered over various portions of the Dominion, is somewhere near 36,000 square miles, of which the average depth may be more conservatively stated at 6 feet rather than 20 feet.

In comparing the wet and dry processes for manufacture of peat fuel, the statement is made that fuel made by the wet process is more dense than that resulting when the dry process is employed, and that the volume of a ton of wet process peat fuel is less than that of a ton of the dry process fuel. This is incorrect. The peat manufactured according to the dry process, as described in

the article, is briquetted, and is consequently more dense and therefore occupies less space per ton of fuel than the wet process peat.

The calorific power or heating value of peat fuel is overstated as being 10,000 to 12,000 B.T.U. per lb. At least this is true as far as Canada is concerned. The highest heating value per lb. of dry peat so far obtained with Canadian peat is 9,500 B.T.U. per lb.

Owing, however, to the high percentage of ash contained in anthracite coal now supplied for domestic fuel, a considerable quantity of the heat of the fuel is not utilized for useful purposes, but goes in part to maintain the temperature of the ash and clinkers at the temperature of the combustion zone. Moreover, the ash and clinkers prevent the complete combustion of the carbon in the fuel, part of which passes into the ash unconsumed. For the above reasons, peat with its low and non-clinkering ash content—at ordinary stove temperatures—can be more efficiently utilized for many household purposes, and burns in an ordinary cooking range or fire place down to a fine powdery ash containing no carbon whatever.

In conclusion it may be stated in order to remove erroneous impressions, that the plant at the Alfred peat bog has not been operated by the Department of Mines during the last two years. The bog and the improved plant installed thereon, which is described in the article in question, are owned by private parties who expect to produce peat fuel in commercial quantities during the coming summer.

No industry perhaps has suffered more from the roseate and extravagant prospects held out by stock-selling promoters to the more ignorant and readily gullible section of the public, than has the peat industry. Only when it is generally realized that the industry offers modest returns for investment under the most favorable circumstances, and that even these returns are not dissociated from a certain amount of risk, can we hope for the establishment of a sound industry which will be of economic advantage to the country, as well as affording a fair return to investors. It is in the public interest therefore, as well as that of peat men, that any statements published in connection with the industry should be able to stand the severest scrutiny.

We have recently received a prospectus issued by a Company which claims to own a "demonstrative plant," now in full working order in Montreal.

The prospectus, which is unsigned, states that "with our Gas Process," the peat bogs of Canada and United States "are real Gold Mines at the surface of the earth." No gold mines yet discovered would be a circumstance to the value of the peat bogs, if the statements made were fully capable of verification. But judging from the inducements held forth to purchasers of stock in the Company, the peat bogs are not the only gold mines intended to be worked.

The Company has an authorized capital of $1,000,000 and is said to be duly authorized "to carry on a business of producers and distributors of a gas obtained out of peat under a patent process and to sell the prepared peat for making gas." On the first page of the prospectus, it is stated that "the Company has secured full rights to this invention for the total sum of $480,000," while on the last page one learns that "as an evidence of their faith in the undertaking, the vendors are taking shares to the full amount of their sale price." So far as the prospectus shows the only real money in the concern, excepting perhaps whatever the charter and the "demonstrative plant" may have cost, is apparently, therefore, to be supplied by the public who are invited to subscribe in the following terms:—

> "What we think is a bonanza to the investors, we are offering today the common stock of our Company, which will have a big raise of say over a 100% shortly, at the par value of $10.00 per share nett. This is your chance, as our offer is limited to only the first $150,000, part of which is already subscribed. Get in quick to this great offer."

If $480,000 of the Capital Stock has been paid for the patent rights, and the public are to be allowed the privilege of absorbing $150,000 more at par, it would be interesting to know the disposal of the remaining $370,000 of stock but the prospectus affords no information on this point.

Nor does it give any names of directors to the Company with the exception of "The Ingegnere Antonio Conti of Milano, Italy, who is a director of the Company, and a consulting engineer on the Gas Industries for the English, Italian, German and French Governments, and the author of a few internationally well known books on the Gas Industries, and an expert on the peat industries at large." Neither is any information given as to the proposed disposal of $150,000 to be raised by sale of stock to the public.

The cost of a plant of 120 tons daily capacity is stated to be only $13,400 as follows:—

"Structure	$3,00000
Machinery	2,000.00
Gas Engine (120 H.P.)	2,500.00
Elevators	1,000.00
Pulleys and Belting	900.00
Shafting	500.00
Excavating Apparels	3,500.00
Total	$13,400.00"

while "A peat Gas Factory costs about one-tenth of the ordinary Coal Gas Works."

"By the Company's process," it is said, "peat is turned into commercial and public in the form of Gas, *without the need of extracting the moisture.*" "Therein lies the real advantage of the process," etc., and a couple of pages further on.—"We again emphasize that peat is transformed into gas matter without the necessity of pressing and drying it."

As peat in its natural state contains 88 to 90 per cent. water, and this is not reduced by draining below say 85%, this means, if it means anything, that "A gas

of superior quality to any gas manufactured" is to be made principally from water.

Another astounding claim is, "Again and in accordance with our prospectus, *this process of ours being the only one known to extract Gas out of peat,*" &c.

The production of gas from peat is an established industry in Europe. At Oldenberg, Germany, Pontedera, Italy, and elsewhere, there are large electric power plants operating on peat gas generated by Mond and other producers.

All these plants use partially dried peat for production of gas suitable for power production, but the Company claim to take the raw peat from the bog at a cost of 19 cents per ton and by adding $1.60 worth of chemicals to peat containing say 85% moisture (1700 lbs. of water to 300 lbs. of dry peat), to produce a "prepared peat" which will yield a superior illuminating gas.

As above mentioned the prospectus states the cost of a plant of 120 tons daily capacity at $13,400. According to the figures given a single plant would yield a daily profit of $240.00 or $87,600 for a year of 365 days, a mere trifle of 650% per annum. But the minds of the promoters are not cast in a small mould, and such profits do not appeal to them.

Here are their estimated profits:—

"Profits calculated to a minimum, for a daily output of 1,000 tons:—

Yearly output	365,000 tons.
365,000 tons sold to factory at $4.00 per ton	$1,460,000.00
Cost—365,000 tons at $2.00 per ton	730,000.00
Yearly profit on 365,000 tons prepared peat	$ 730,000.00

"A quantity of 1,000 tons is only a minimum, as a part of this is already under contract, and the Company hopes within the next six or twelve months, to have a sale of about 5,000 to 10,000 tons per day, and this will give an idea of the benefits which our Shareholders will derive."

On what the Company bases its hope of a daily sale of 5,000 to 10,000 tons within the next six or twelve months would be hard to say seeing that they have only at present a "demonstrative" plant, and our climate makes it impossible to get on a peat bog to work during the winter months.

But this is not all. They are going to deal in valuable franchises.

"There are about 15,000 incorporated cities, towns and villages in Canada and to all the Peat Gas will appeal. If we only get 2% of these municipalities, we shall have three hundred franchises to write down to the tyde of our activities, and this represents the smallest approximate figure. Each franchise is worth about from $25,000.00 to $100,000.00 and it has to be noted that each contract would cover a period of from 25 to 30 years, and this will represent a clear profit of $1,000,000.00 from franchises alone, taken at a minimum."

Combining these figures, we have an annual profit of $730,000 on 365,000 tons of prepared peat sold to the factory, and a profit of $1,000,000 on franchises alone. On the sale of 5,000 to 10,000 tons per day which "the Company hopes to have within the next six or twelve months," there ought to be according to their calculations an additional profit of $2.00 per ton on 4,000 to 9,000 tons daily for 365 days, or a further annual profit of $2,920,000 to $3,285,000, giving a total

annual profit of $3,650,000 to $4,000,000, with a bonus of $1,000,000 to be derived from sale of franchises, and all on an initial investment of $150,000.

For fear these figures might be looked upon as a little extravagant, the promoters cite how money invested in oil has given enormous profits, *e.g.* $100 invested in the Home Oil Company has since attained a value of $40,000, in addition to the dividends.

One might wonder where the market was to be found for the 5,000 to 10,000 tons of prepared peat to be turned out daily but the promoters are prepared on that point. The prospectus says, "Negotiations are pending for the sale and export of peat treated by our process. This company can export peat already treated to extract gas at $4.00 per ton, making the handsome profit of $2.00 per ton nett."

As to the foreign markets the prospectus says:—"Natural peat is now sold in Europe at about 2 shillings per cwt. (50 cents, per 110 lbs.), which means at an average of $8.00 per ton."

An official report published by the Mines Branch of the Department of Public Works of France giving yearly statistics of the mineral production of France for 1911, shows that the total production of peat in France during that calendar year was 58,521 tons, and that the average price of same was 12 fr. 57 c. ($2.45).

Official figures from other European countries would afford an equally striking commentary on the statement of the prospectus that peat is sold in Europe at an average of $8.00 per ton.

When the peat industry is only moderately remunerative in European countries where labor can be secured at 60 to 75 cents per day and often less, the idea of producing it in Canada for export to Europe has at least the merit of originality.

But let us quote the prospectus further:—

> "According to Government Reports, England draws from Holland natural peat at a rate of 50,000 tons every year, without counting another 400,000 tons yearly drawn from other sources, and the home production. We had dates on file to show that we can export at an enormous advantage Prepared Peat to almost any country."

A recent report by the Commercial Department of the Netherlands Ministry of Agriculture, Industry and Commerce, expressly states that all the peat produced in Holland is sold in the country itself. What is exported from Holland to England is peat moss litter for bedding horses and cattle and other purposes. Unless the proposal is to inflate bags with gas and bed the horses on these, it is hard to see how this market will be of service to the promoters of the present industry.

The prospectus in question would not deserve so much attention as it has been here given, if it were not for the fact that reckless mis-statements tend to discredit the legitimate peat industry in the mind of the public.

Four years ago, the Mines Branch investigated and reported on a somewhat similar process known as the Harris Peat Gas Process, the plant being situated in Newark, N.J. Their findings were published in the Summary Report of the Mines Branch for 1909. Among the numerous claims made by the inventor were:

(1) That peat containing upwards of 75 per cent. of moisture, rendering it unfit for other purposes on account of the large amount of heat necessary to evaporate the moisture can be utilized by this process, yielding a superior gas for light, heat and power.

(2) That one ton of peat containing upwards of 75 per cent. moisture when treated according to this process, will produce 12,000 to 14,000 cubic feet of gas, and will have a candle power nearly double, and a calorific value of one-third to one-half more than that of city gas.

(3) That by means of this process a charge of waste material such as peat can be retorted in less than half the time required to retort a similar quantity of coal, thereby saving enormously in time, fuel and labour, as well as tremendously increasing the output.

The process consisted in treating raw peat with a mixture of chemicals. Careful tests and analyses were made by an engineer and chemist sent to Newark by the Mines Branch.

The result of the investigation was to shew that the peat used contained petroleum before treatment, that a ton of the treated material would yield 8,650 cub. ft. of gas of a calorific value of 640 B.T.U.

80 lbs. of 75% moisture peat retorted shewed the following results:—

Water contained	60 lbs.
Dry peat substance	20 lbs.
Oil added with chemicals	4.32 lbs.
Oil found in peat	2.60 lbs.
Total oil in peat	6.92 lbs.

The oil added to the peat was shewn to supply 59.4% of the heat units of the gas produced.

The heat value of the gas supplied by the peat alone was insufficient to evaporate the water and maintain the temperature of the retort necessary for gasifying dry peat. 94 lbs. of coke were consumed in retorting 80 lbs. of peat.

The time consumed in retorting 80 lbs. of peat was practically the same as would suffice to retort 400 lbs. of coal. The residue, corresponding with coke produced from the retorting of coal, was in a finely divided state, and of no commercial value.

The conclusions arrived at were, in brief, that the operations, mechanical and thermic, did not show the process to be economical or the products of commercial value, in fact, that none of the claims investigated were substantiated.

NEW MANURE FROM PEAT.

By Mr. J. M. Mussen, Leeds, Eng., Sept. 27th, 1913.

A cheap method of obtaining organic artificial manure was described by Prof. W. A. Bottomley at a meeting of the Agricultural Section of the British Association.

It was asserted that by the treatment of ordinary moss litter with bacteria, an organic manure is formed, a ton of which it was claimed is worth more than 80 tons of ordinary farm manure. It has been found that the insoluble humic acid present in large quantities in peat can be readily converted into soluble humate by the action of certain aerobic soil bacteria.

Peat, after treatment with these organisms, is sterilized, and then inoculated with a culture of nitrogen-fixing organisms. This prepared peat can then be used for soil inoculation, either by direct application to the soil, or preparing from it a culture solution.

Experiments made at Kew upon plants demonstrate the remarkable effect which this peat has on plant growth, and at Chelsea Physic Gardens a plot of radishes watered once with an extract of prepared peat, gave an increase of 54 per cent. over another untreated plot. At Eton school gardens, the new preparation has been tried in competition with farmyard manure, and it gave the following increases: Lettuce, 27 per cent.; turnips, 23 per cent.; and potatoes, 41 per cent.

Ordinary organic manure is getting scarcer owing to the substitution of horses by motor-drawn vehicles and peat, it is stated, may become a marketable substitute.—Weekly Report, Department of Trade and Commerce, Oct. 13th, 1913, page 1207.

(The comparison made with ordinary stable manure, while apparently very favorable to the treated peat-moss litter, would appear to call for further confirmation before it can be fully accepted. Without having available the full text of Prof. Bottomley's paper any comment must be mere guess-work. We therefore print the item as it appears in the Weekly Report of the Department of Trade and Commerce in the hope that it will put some of our members upon enquiry and investigation of the statement which is of great importance if capable of full verification.—Ed.)

PEAT AS A FERTILIZER.

In a recent issue of the Farmer's Advocate, published in London, Ont., the following question and answer appeared.

"Q. I have rented an orchard of two hundred and fifty trees, all sizes, some just starting to bear and some very old ones. The soil is light and gra-

velly. The orchard has been neglected and is in bad shape. There is a peat bog adjoining, and the peat could be easily applied. Would it be of any value as a fertilizer?" A.L.M.

Ans. "As yet, in this country, peat has not been used to any appreciable extent as a fertilizer, owing to the fact that a large quantity would have to be handled in order to obtain a small quantity of fertilizing ingredients. Whether the peat near your orchard could be profitably applied as fertilizer or not, depends largely upon the character of the peat. The one outstanding ingredient of peat would be the nitrogen content. If this is high enough to warrant your applying it, then you could probably do so, because the organic matter in the peat would enhance the mechanical conditions of the soil. Send a sample to the Chemical Department, Agricultural College, Guelph, and have it analyzed for its fertilizing ingredients. Recently a method of treating peat and moss has been discovered in England by which one ton of the treated peat equals over eighty tons of barnyard manure. If this method could be established in Canada, your peat bog might be very useful."

Ed.—It is to be hoped that A.L.M. will not only have his peat analyzed but will make a practical test of peat as a fertilizer by applying it to a portion of his orchard, leaving some of the trees without as a check. Where peat is located as in this case near light soil such as described, there should be little doubt as to its being an economic fertilizer. The process for treatment of peat referred to by The Farmer's Advocate is elsewhere dealt with in this issue.

THE WORLD'S SULPHATE OF AMMONIA PRODUCTION.

According to an authentic report, the world's production of sulphate of ammonia in 1912 was 1,331,000 tons, against 1,191,000 tons in 1911. This was made up as follows:—Germany, 492,000 tons, against 418,000 tons in 1911; England, 379,000, against 378,500; United States, 151,000, against 115,000; France, 69,000, against 60,000; Belgium, 50,000, against 40,000; Italy, 15,000; and Austria, Russia, Spain, Denmark and Holland, 175,000 against 169,500.—Weekly Reports, Department of Trade and Commerce.

SULPHATE OF AMMONIA.

USE AS A FERTILIZER IN ENGLAND.

Within the last few years rapid strides have been made in England in connection with the production of Sulphate of Ammonia, due to the large increase in the number of by-product coke ovens. A speaker at a recent dinner at Worsbro' pointed out that artificial fertilizers were not used in England to

anything like the same extent they were used in foreign countries, citing Germany, where the annual production of Sulphate of Ammonia was 440,000 tons, of which over 90 per cent was for domestic consumption. The production in the United Kingdom was 400,000 tons, and only 20 per cent. of this was used in England, the balance being exported.

Reference was made to the Sulphate of Ammonia Committee which has been formed to carry on propaganda work, and to extend the use, and make known the utility of sulphate. The producers of Sulphate were at present subscribing to the Sulphate Committee 9d. per ton on their output for this work. Experiments of the Committee during the last three years proved that 15s. per acre spent on Sulphate meant a return of 30s. when applied to cereals. As there were some six millions worth of Sulphate being made in the country, this meant that if all that was made was used in the country, the crops would be worth another six million pounds.—Colliery Guardian.

BRITISH IMPORTS OF MOSS LITTER, 1898-1912.

	Quantities Tons	Declared Values £
1898	80,449	94,681
1899	67,155	78,548
1900	76,925	90,690
1901	83,038	102,259
1902	96,075	123,075
1903	88,470	111,889
1904	93,183	115,953
1905	89,755	109,431
1906	88,072	106,999
1907	80,703	98,849
1908	76,470	93,498
1909	76,801	93,691
1910	76,064	91,341
1911	78,906	93,267
1912	101,864	122,727
Total for 15 years	1,253,930	1,526,898

Average price per ton £1.217—$5.90.

Statistical Abstract for the United Kingdom, 1898-1912, pp. 140-141, 156-157.

PEAT POWDER FOR LOCOMOTIVES.

In the August issue of the Journal there appeared an extract from a recent Report by C. E. Sontum, Canadian Commercial Agent at Christiania, Norway, having reference to the Ekelund process of manufacture of peat powder. One or two points in same are worthy of comment. The statement that "Several of the railways in Sweden have entirely gone over to using powdered peat for their engines," is rather broader than is warranted. Through independent enquiry we learn from a reliable source that the use of peat powder on locomotives in Sweden has thus far been experimental, and that none of the railways has thus far adopted it as a general fuel. Obviously this must be the case owing to the small supply as yet available. From the fact that the production of the only plant mentioned in the report is 15,000 tons per annum, it may be seen that the use of peat powder as a fuel on Swedish railways cannot as yet be very extensive.

There can be little doubt, however, that powdered peat fuel is likely to be of considerable importance for railway use. Powdered coal is extensively used in burning cement with excellent results. And it has latterly been successfully used on locomotives in the United States. An article on Pulverized Coal for Locomotives, by Walter D. Wood in a recent number of the Railway Age Gazette, makes some interesting statements in this connection, and points out causes of earlier failures in its use. These were mainly, trying to pulverize the coal on the engine itself, blowing the coal dust into the fire box with too great velocity, and troubles with slag.

It is pointed out that in order to use coal dust successfully on locomotives they must be equipped with special firebox construction, giving an ample surface of fire brick to blow the powder against. A special form of nozzle is also required, and such arrangement for air supply as will reduce the velocity of the entering dust to a minimum, permitting it to expand and burn before it is carried into the tubes.

The advantages of pulverized coal are thus stated:—

"There is a direct saving of one-third of the coal through more perfect combustion, a saving by the abolition of ash-pits and cleaning gangs, a direct saving in the ability to cut off the fire at will while standing in stations and on sidings, a saving in property values and paint on rolling stock through absence of smoke and cinders, etc. Added to all this is the wonderful flexibility of the fire, the supply of coal and air being increased or decreased at will by the turn of a valve. In switchers and other small engines a fireman would be superfluous. One of our largest locomotive companies at the present time is spending some $50,000 to adapt powdered fuel to locomotives."

One important cause of failure cited in connection with the use of coal dust would not be operative where peat powder is substituted, viz., troubles with slag. In the other respects mentioned peat powder should compare very favorably with coal dust.

THE RELATIVE VALUE OF PEAT LITTER.

In a verbal communication to the Editor of the Journal of the American Peat Society, a stable keeper in Michigan who for some years had used peat litter for his horses to the exclusion of all other kinds, said he considered peat litter well worth $15 per ton, the price he was then paying for it, when he could buy wheat straw at $8 in the local market. The peat litter lasted more than twice as long and his horses' feet were in far better condition than when he had used straw. Aside from these facts he said that all objectionable odors were entirely eliminated from his stable even in the hottest summer weather.

PEAT IN NEWFOUNDLAND.

The St. John, Newfoundland, News of November 21st, contains a report of Port de Grave Agricultural Exhibition, the first of its kind ever held in the district. The report states that the exhibition was from all standpoints a complete success, far exceeding the anticipation of the Committee that had it in charge. Among the products shown were several exhibits of peat, but no particulars are given as to the class of peat or method of production. In all probability they were hand-made by the methods which have been in use by the fishermen and farmers of Newfoundland for years past.

PATENTS RELATING TO PEAT ISSUED BY THE CANADIAN PATENT OFFICE.

148809—June 24, 1913. Peat Expresser.

Oscar J. Sigler, Mansfield, Ohio, and Henry J. Jarvis, Toledo, Ohio.
Assigned to the Union Peat Company.

This patent covers a press for extracting a portion of the moisture from peat. The essential features of the machine are an upper and lower endless platform, each consisting of transverse strips of wood, those of the lower platform being perforated. The platforms move on rollers revolvably mounted on L-shaped brackets and rigidly connected to the strips, and are covered by endless canvas belts to prevent clogging. The platforms are brought closer together at one end so that the peat fed in at the wider end receives gradually increasing pressure as it approaches the outlet, the liquid being forced through the perforated lower platform.

149597—Emil Hirsch, Engineer, 7 Heilbronner Strasse, Berlin-Wilmersdorf, Germany, July 29th, 1913.

Method of Dessicating Peat and the Like.

The invention relates to a method of dessicating peat and the like by the simultaneous or alternate application of pressure and a vacuum, while the pressure and the evacuation or either of these processes can be intermittently interrupted. The simultaneous pressure and evacuation, or each process by itself goes down during the interruption practically to nought. It is stated that any cells containing moisture which during the first compression may not have been entirely opened, will on the pressure dropping to nought again assume their normal position and at the following pressure another part of them will be opened and expressed. The result of this method of treatment is expected to be more perfect, the oftener the pressure is interrupted during the period of treatment of the material.

The apparatus for treatment consists of two vessels placed one inside the other, leaving a hollow space between them. The inner vessel is perforated in its bottom and sides and is provided with tubes, likewise perforated, extending in the direction in which the pressure acts and communicating with the space between the vessels. A perforated piston working in the inner vessel produces the mechanical pressure. Pipes are provided in the outer vessel for producing the vacuum and draining out the water.

Claims:—

1. A method of dessicating peat and the like by simultaneously applying pressure and a vacuum, the said pressure and evacuation being intermittently interrupted and at such interruption allowed to drop off to practically nought.

2. A method of dessicating peat and the like by alternately applying pressure and a vacuum the said pressure and evacuation, each by itself, being intermittently interrupted, and at such interruption allowed to drop off to practically nought.

149668—July 29, 1913. Edward Fox Strangways Zohrab, Baronet of Scotscalder, Thurso, in the County of Caithness, Scotland.

Improvements in or Relating to the Drying or Carbonizing of Peat.

The invention relates to a process of and apparatus for the treatment of peat for rendering the same in condition for industrial purposes, the chief object being to obtain peat charcoal in a harder and more dense form than is possible by methods at present practised. The peat after being ground and mixed with added water and moulded into bricks of suitable size, is dried in a rotary drying chamber, the sides of which are jacketed with hot air or steam, and is delivered from this chamber into a charring oven for conversion into charcoal and production of peat gas. The claims cover a grinding, kneading and moulding machine, chamber or drum for drying the peat bricks, and charring oven as described.

151670—William B. Bottomley of King's College, London, Nov. 11, 1913.

Treatment of Peat for Manurial and Other Purposes.

According to this invention peat can be converted into an excellent manure by treating it with micro-organisms capable of producing ammonia. Such micro-organisms are obtainable by known methods from ordinary soil or from other sources such as putrefying bouillon. There are several species of them, such as Bacillus mycoides, Bacillus subtilis, Bacterium aerogens, and Bacterium fluorescens liquefaciens. It is not essential to use a pure culture of any particular species or of the mixed species, since other micro-organisms may be present.

The effect of these micro-organisms on the peat is to convert the humic acid and humous bodies contained in it into compounds soluble in water and at the same time to disintegrate the peat so that it is readily distributed.

A product richer in nitrogen is obtained if nitrogen-fixing organisms such as Azotobacter and Bacillus radicicola are present in the mass.

In addition to its usefulness as a manure, the product forms a ready source of the substances known as humic acid or humous bodies, which have lately found application in industry.

There is no difficulty in obtaining a culture of micro-organisms, containing no doubt very many species, suitable for the invention. For this purpose 10-20 grams of fertile soil may be added to a culture medium comprising 1 litre of water, 20 grams of dextrin, 1 gram of dipotassium phosphate, 1-2 gram of magnesium sulphate, 2 grams of calcium carbonate and 10 c.c. of bouillon. The scum which forms on the surface of the liquid in the course of a few days is suitable for the invention. Pure culture consisting of any of the individual species that are active for the purpose or mixed cultures may of course be prepared but this is not necessary.

To the peat or peat material is added water containing the organisms and the mass is allowed to undergo the change involved, for some days. When the peat has been dried, as is the case with certain prepared peat, the amount of water added should suffice to moisten the mass thoroughly. It is not however, necessary to dry the peat, for if this is in its natural wet condition it may be merely sprinkled with the water containing the micro-organisms. The process is preferably hastened by adding to the mass a nitrogenous organic material, particularly a weak solution of a soluble nitrogenous organic material, such as albumin, gelatin or meat extract; a solution containing say 0.25-0.5 per cent. of any standard meat extract, for example, will serve. Such a solution may constitute the liquid in which the micro-organisms may be contained as aforesaid. A very suitable nitrogenous extract consists of the waste liquor obtained from the boiling of bones.

It is also desirable to add a small proportion of a carbo-hydrate such as sugar or starch; say about 0.1 per cent. of the dry weight of the original peat, dissolved or suspended in a little water.

The saturated peat may be left at a temperature of 24°-30° C. for three weeks or thereabouts and may then be dried. In this condition it may be applied directly as a manure. Or before it is dried it may be sterilized, such as by live steam, and then further treated with nitrogen-fixing organisms for increasing the amount of nitrogen in the mass, these organisms being capable of growing in the altered peat.

If soluble humous substances be required the treated mass may be leached with water, and the solution used directly for any of the purposes to which humus is applied; or an acid may be added to precipitate the humic acid from the aqueous solution. The aqueous extract of the treated peat is also useful as a liquid manure.

Claims 1-16 cover the various methods of carrying out the process described in the above specifications, while Claim 17 is as follows:—

"As a new product peat or a prepared form of peat which has been subjected to the action of ammonia-producing micro-organisms and contains soluble humates."

CORRECTION:—The number of Joseph Berglund's patent reported on page 29 of the August Journal should be 149571 instead of 179991 as there printed.

A recent British patent, No. 29429, 21st December, 1912, describes improvements in methods of handling peat fuel now followed at Okaer, Denmark, and elsewhere in Europe, devised by Lt.-Col. F. T. Warburton of the Royal Engineers, London, England.

According to the Report of Erik Nystrom (1908) with labour at 96 cents per day, machined air-dried peat was produced at Okaer at a cost of $1.50 per ton. The method employed in handling the peat as it came from the excavators was to pour it into dump cars for conveyance to the drying ground. From these it went into moulds containing from 50 to 70 cakes. The moulds were somewhat unwieldy and considerable loss of time occurred in the various operations.

Col. Warburton uses a smaller mould, preferably of galvanized iron, and of a size to be readily handled by two men, fitted with loose iron plates held underneath by two loose right angled brackets on each side so that the pulp cannot fall to the ground when they are lifted. A number of these moulds with bottom plates clasped on are laid on a platform car touching each other. The peat is poured in a bottomless box of the same area as the combined moulds

resting on an iron plate which can be raised or lowered to the level of the top of the moulds. The box filled with peat is pushed over the moulds, filling and smoothing them. The box is then withdrawn and the operation repeated with another set of moulds until the car is loaded. The moulds are conveyed to the drying ground where two men unload them, and when the peat is dry enough to retain its shape the bottom plates are withdrawn and the moulds raised and they are then ready for use again.

Col. Warburton claims a very considerable saving of time and increase of capacity as the result of his improvements, and estimates a saving in cost production of 48 cents per ton with other conditions similar to those described at the Okaer plant.

DRYING PEAT FOR GAS PRODUCERS.

A recently issued French patent describes a process whereby disintegrated peat is pressed into a thin cake between two endless filtering bands which pass between perforated metal supported plates or over a metal pulley and are suitably tensioned. The moisture in the peat is thus reduced 60 to 80 per cent. The peat is then further dried by exposure to hot air or to the heat of the sun. A suitable hot-air dryer comprises a chamber through which large quantities of hot air are blown in the upward direction, whilst the peat cake, in small pieces, travels from the top downward in a zig-zag path on a series of endless bands.—The Canadian Engineer.

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